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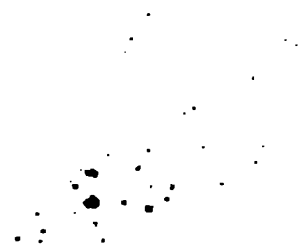
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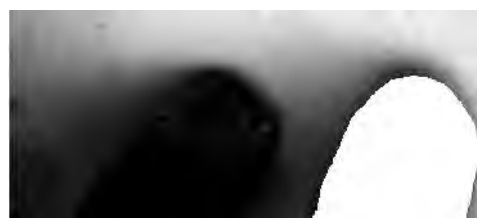
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VOLUME II.

COMPRISING

THE EAST COAST, TORRES STRAIT, AND CORAL SEA.

ALSO, THE GULF OF PAPUA, EASTERN COASTS OF
NEW GUINEA, AND LOUISIADE ARCHIPELAGO.

COMPILED CHIEFLY FROM VARIOUS SURVEYS MADE BY ORDER OF THE LORDS
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ADVERTISEMENT TO THE THIRD EDITION.

The Australia Directory, Vol. II., contains sailing directions for the East coast of Australia, between Sydney and cape York ; for Torres strait and its approaches ; and for that large tract of the South-western Pacific ocean, to which the name of Coral sea has been given. To this is added a description of the shores of the eastern end of New Guinea (including the Louisiade Archipelago) from Torres strait to the East Cape, and thence north-westward to cape King William of Dampier.

The first edition of this work was compiled by Commander C. B. Yule in 1859, chiefly from the records of the several explorations and surveys undertaken by the British Government, beginning with that conducted by Cook (the discoverer of the East coast) in the year 1770, followed in 1799-1803 by Flinders. With those explorations were embodied the labours of Captains P. P. King, Blackwood, Owen Stanley, Stokes, Denham, Commander Wickham, and Lieutenant Yule, Royal Navy, extending from 1819 to 1858.

A revised edition, second, was published in 1864, containing a more complete description of the islets and reefs in the Coral sea, and sailing directions for the Outer route to Torres strait, derived from the survey under Captain Denham, H.M.S. *Herald*, in 1859-61.

In the present edition, chiefly revised by Captain Inskip, R.N., is incorporated the results of various surveys and examinations made by Captain Moresby, Staff-Commander Bedwell, Lieutenants Dawson, Richards, and Connor, of the Royal Navy, to 1878 ; also the latest information as obtained from Colonial authorities, from the Remark Books of Officers of H.M. Ships, and other sources, including the early French navigators.

Notwithstanding the care bestowed in the execution of the various surveys, extending over so many years, portions of the regions distant from the ordinary tracks of navigators must be considered imperfectly explored ; this, with the difficulties attending the detection of dangers in coral waters, will doubtless furnish occasion for revision and amendment..

F. J. E.

Hydrographic Office, Admiralty, London,
August 1879.

CONTENTS.

CHAPTER I.

SYDNEY TO PORT STEPHENS.

	Page
Port Jackson. Characteristic features of the coast, when approaching Sydney heads. Signal station. Lights. General description of the harbour. Docks. Pilots. Port regulations - - -	1-16
Soundings. Winds and weather - - - - -	16-18
Directions. Unfavourable times for entering port Jackson. From the southward, through the West channel, through the East channel -	18-22
From the eastward. From the northward. Working into port Jackson. Necessity for smart working, and readiness to anchor. Tides -	22-25
Coast from port Jackson to port Stephens. Long point reef, and marks for clearing it - - - - -	25
Broken bay. Pilot signals. Hawkesbury river. Lights. Tides. Directions - - - - -	25-29
Broken head. Tuggarah reef. Eight-fathoms patches. Norah head. Lake Macquarie. Hunter river - - - - -	29-31
Newcastle harbour. Lights. Pilot signals. General description of the harbour. Tides. Directions. General remarks - - -	32-39
Coast from Newcastle to port Stephens to be approached with caution on account of rollers - - - - -	40
Port Stephens. Lights. Anchorages off the entrance. Anchorages within the port. Tides. Directions. Winds - - - - -	40-47

CHAPTER II.

PORT STEPHENS TO SANDY CAPE.

Coast from port Stephens to Tacking point. Broughton isles. Sugar-loaf point and lights. Edith breaker. Seal rocks. Cape Hawke -	48-53
Manning river. Pilot signals. Light. Tides. Directions. Mermaid reef. Tacking point - - - - -	54-56
Coast from Tacking point to Coffs islands. Port Macquarie and Hastings river. Tides. Directions - - - - -	57, 58
Coast from port Macquarie to Smoky cape. Trial bay. Macleay river. Coffs islands. Solitary islands. Light - - - - -	58-62
Clarence river. Light. Tides. Directions. Means for repairing vessels. Richmond river. Pilot. Lights. Tides. Directions. Cape Byron. Mount Warning. Cape Byron bay. Tides - - -	62-66

	Page
Danger point. Fingal point light. The Boundary line. Tweed river.	
Tides. Danger reefs. Coast from Danger point to cape Moreton.	
Stradbroke island. Coast from south extreme of Stradbroke island	
to Look-out point. Coast current. Rous channel. Caution -	66-71
Moreton island. Cape Moreton and light. Signals. Pilots. Smith	
rock. Flinders reef. Hutchison shoal - - - - -	71-74
Moreton bay. Lights. Pilot station. North and East banks. North,	
Ship or Main, Howe, Middle, and Freeman channels. Harbour	
reach. Yule road. Yule bank - - - - -	74-79
General description of Moreton bay. Bribie island. Pumice-stone	
strait. Tides. Brisbane road. Lights. Signals. Brisbane river.	
Brisbane, supplies. Quarantine ground. Cleaveland light. Tides.	
Directions - - - - -	79-96
Glass-houses. Coast from Moreton bay to Sandy cape. Soundings.	
Maroochy river. Laguna bay. Coast from Laguna bay to Inskip	
point. Double island point. Wide bay. Wide bay harbour. The	
bar. Pilot. Signal station. Tides. Directions - - - - -	96-100
Great Sandy strait. South entrance. Directions. Mary river. Tides.	
Maryborough, supplies. Northern entrance. Lights. Tides. Di-	
rections - - - - -	100-108
Great Sandy island. Platybus bay. Water, natives. Indian head.	
Sand cape and light. Breaksea spit. Directions. Tides - - -	108-111

CHAPTER III.

SANDY CAPE TO CAPE GLOUCESTER, INCLUDING PORT CURTIS, THE GREAT BARRIER REEFS, AND INNER ROUTE.

Hervey bay. Tides. Directions for proceeding round Breaksea spit -	112, 113
Burrum river. Burnett river. Lights. Pilot. Signals. Directions.	
Tides. Coast from Sandy cape to Keppel isles - - - - -	113-116
Bustard bay. Bustard head and lights. Pancake creek - - - - -	116-118
Rodd bay and harbour. Directions. Water. Mount Larcom - - -	118, 119
Port Curtis. East and West banks. South and North channels.	
Gladstone. Auckland creek. General description of port Curtis.	
Gatcombe head. Lights. Tides. Directions - - - - -	119-127
Eastern coasts of Facing and Curtis islands, from Gatcombe head to	
Keppel bay to be approached with caution - - - - -	127, 128
Cape Capricorn and light. Keppel bay and deceptive colour of the	
water. Off shore island and rocks. Pilots. Lights - - - - -	128-132
Fitzroy river, Rockhampton. Lights. Signals. Tides. Directions	
for Keppel bay - - - - -	132-135
Islands and reefs near the coast between Sandy cape and Keppel isles.	
Lady Elliot island. Turtle. Light. Tides. Bunker and Capri-	
corn groups. North reef light. Tides. Directions - - - - -	135-141
Keppel isles. Tides. Scattered islands and rocks off shore. Coast	
from Keppel bay to cape Manifold - - - - -	141, 142

CONTENTS.

vii

	Page
Cape Clinton. Coast northward of cape Manifold. Port Bowen. Entrance island. The bar. Description of the port. Anchorage. Supplies. Directions. Tides - - - - -	143-147
Coast northward of port Bowen. Mount Westall. Hervey isles. Tides. Strong Tide passage. Cape Townshend. Shoal-water bay, and islands off it. General description of the bay. Natives. Tides -	147-154
Long island. Thirsty sound. Broad sound. North point and Flat islands. St. Lawrence and Waverly creeks. Pilots. Light. Banks. Channels. Anchorage. Water. Great rise of tide. Directions -	154-163
West hill. Good supply of water. Bedwell group. Caution. Connor islet. Yaralla shoal - - - - -	163, 164
Deceptive appearance of the bays and creeks between West hill and cape Palmerston. Aspect. Mount Funnel. Cape Palmerston -	165
Northumberland isles. Tides. Beverley group. Percy isles. Hostile character of the natives. Water. Anchorage. Tides - -	165-172
Coast from cape Palmerston to Pioneer river. Hay point anchorage. Pioneer river. Pilot. Light. Tides. Signals. Directions. Slade point. Dangers off Shoal point - - - - -	172-177
Cape Hillsborough. Aspect. Water. Coast from cape Hillsborough to Midge point. Directions. Natives - - - - -	177-179
Cape Conway. Repulse bay and isles. Tides. Water - -	179, 180
Long island. Port Molle. Anchorage. Wood and water. Directions. Molle isles. Pioneer rock. Mount Dryander. Cape Gloucester. Gloucester island. Hyacinth shoal - - - - -	181-184
Cumberland islands. Sir James Smith group. Dent island. Whitsunday island. Tides. Water and wood. Wind and weather -	184-193

GREAT BARRIER REEFS BETWEEN THE PARALLELS OF PORT BOWEN AND CAPE GLOUCESTER.

Vast extent of the Great Barrier reefs and their obstructions to navigation - - - - -	193
Swain reefs. Difficulty in making out the entrances, in consequence of the overlapping of the reefs. Inner edge. Tides. Caution -	193-195
The barrier from Swain reefs to abreast of cape Gloucester little known, but supposed to consist of a chain of detached reefs. Tides -	195, 196

INNER ROUTE FROM SANDY CAPE TO CAPE GLOUCESTER.

Extent of the Inner route from Sandy cape to cape York - -	196
Curtis and Capricorn channels. Soundings. Precautionary hints on navigating amongst coral reefs. Tides - - - - -	196, 197
Respective merits of the channels from Percy isles to cape Gloucester. Eastern or Outer channel. Western or Inner Channel. Tides. Whitsunday passage. Tides - - - - -	198-200

CHAPTER IV.

CAPE GLOUCESTER TO CAPE MELVILLE.—GREAT BARRIER REEFS.—
INNER ROUTE.

	Page
Edgecumbe bay. Middle isle. Port Denison. Pilot station. Aspect.	
Bowen. Supplies. Tides. Lights. Directions. Holborn isle -	201-206
Coast from cape Edgecumbe to Abbott point. Abbot bay. Cape	
Upstart. Anchorage. Water. Tides. Aspect. Upstart bay.	
Wickham river - - - - -	206-208
Cape Bowling-green. Light. Directions. Aspect. Bowling-green	
bay. Burdekin river - - - - -	209, 210
Cape Cleveland. Cleveland bay. Townsville. Tidal signals. Sup-	
plies. Light. Tides. Magnetic island. Directions - -	211-215
Cape Pallarenda. The Main Range. Halifax bay. Aspect - -	215-216
Palm isles. Natives treacherous. Great Palm island. Chilcott	
rocks. Curaçoa island. North Palm island. Zebra shoal, position	
and existence doubtful - - - - -	216-222
Rockingham channel. Tides. Directions. Herbert river - -	222-224
Hinchinbrook island. Cape Sandwich. Rockingham bay. Brooke	
isles. Kennedy shoal - - - - -	224-227
Goold isle. Water. Port Hinchinbrook. Cardwell. Directions.	
Tam O'Shanter point. Family isles - - - - -	227-230
Dunk island. Water. Tides. Directions - - - - -	231
Coast northward of Rockingham bay. King reefs. Barnard isles.	
Mourilyan harbour. Tides. Gladly inlet. Cooper point. Frank-	
land isles - - - - -	232-236
Coast from Palmer point to cape Grafton. Aspect. Cape Grafton.	
Fitzroy isle. Anchorage. Water. Tides - - - - -	236, 237
Trinity bay. Dangerous reef off Island point. Cairns harbour. Tides.	
Water. Anchorage. Port Douglas. Daintree river. Directions.	
Snapper isle. Aspect - - - - -	237-240
Low isles. Light. Satellite rock - - - - -	241
Coast from cape Kimberley to cape Tribulation. Cape Tribulation.	
Weary bay. Bloomfield rivulet. Dangers in Weary bay. Natives	
not to be trusted. Aspect - - - - -	241, 242
Directions. Hope islands. Outlying dangers between cape Tribulation	
and Endeavour river - - - - -	242, 243
Endeavour river and bar. Cooktown. Lights. Tides and signals.	
Directions - - - - -	244-247
Coast northward of Endeavour river. Capes Bedford and Flattery and	
Look-out point. Outlying islets. Rocks and reefs - - -	247-250
Lizard island. Anchorage. Water. Tides - - - - -	250
Murdoch point. Turtle group and reefs. Directions. Coast between	
Murdoch and Barrow points. Cape Bowen. Barrow point and	
doubtful dangers off it. Aspect. Cole islets. r and rr reefs.	
Noble isle - - - - -	251-253
Doubtful Megera rock. Howick group. Ninian bay - - -	253-255
Cape Melville. Hostile natives. Dangerous Channel rock. Pipon	
islets. Light-vessel. Melanie rock - - - - -	255, 256

CONTENTS.

ix

GREAT BARRIER REEFS FROM ABREAST OF CAPE GLOUCESTER TO CAPE MELVILLE.

	Page
Probable outer limits of the Great Barrier reefs. Inner limits. Flinders passage. Trinity opening - - - - -	256-258
Outer and inner limits of the Barrier from Trinity opening to Lizard island - - - - -	258-260
Outer edge of the Barrier north-westward of Lizard island. One-and-half-mile opening. No. 1. Sand-bank-opening - - - - -	260, 261
Soundings outside the barrier. Extensive fields of coral between the barrier and cape Melville - - - - -	261, 262
Inner edge of the Barrier between Lizard island and cape Melville - - - - -	262, 263

INNER ROUTE FROM CAPE GLOUCESTER TO CAPE MELVILLE.

Cape Gloucester to Palm isles. Caution - - - - -	263
Palm isles to cape Grafton. Caution. Tides - - - - -	263, 264
Cape Grafton to Lizard island. Soundings - - - - -	264
Lizard island to cape Melville. Caution. Tides - - - - -	264, 265

CHAPTER V.

CAPE MELVILLE TO CAPE YORK.—GREAT BARRIER REEFS.—INNER ROUTE.

Bathurst bay. Rocky isles. Water. Hostile natives - - - - -	266
Bathurst head. Flinders group. Clear channel between Flinders group and Bathurst head. Tides. Anchorage to the south-westward of cape Flinders - - - - -	267, 268
Low Woody isle and the dangerous a. shoal. Best channel between a. shoal and cape Flinders. b. reef. Clack islet - - - - -	268
Princess Charlotte bay. Aspect. Cliff isles - - - - -	269
Claremont point. Outlying reefs and islet - - - - -	269-271
Coast from Claremont point to cape Sidmouth. Outlying islets. Tides. Caution - - - - -	271
Reefs and islands between Claremont point and cape Sidmouth. No. VI. reef. Light-vessel. Heath rocks - - - - -	272-274
Cape Sidmouth. Coast from cape Sidmouth to cape Direction. Aspect. Chilcott rocks - - - - -	274, 275
Night isle. Dangerous Dugdale rock. Sherrard islets - - - - -	276, 277
Cape Direction. Remarkable ant-hills. Savage character of the natives - - - - -	277, 278
Lloyd bay. Lloyd isles. Outlying reefs - - - - -	278, 279
Cape Weymouth. Restoration isle. Weymouth bay. Natives hostile. Outlying reefs. Quoin isle. Middle reef. Strong current - - - - -	279-281
Fair cape and Kangaroo shoals - - - - -	281
Temple bay. Outlying islets and reefs between Fair cape and cape Grenville. Piper islands and light-vessel. Haggerstone island - - - - -	282-285

	Page
Cape Grenville. Home isles ; due allowance to be made for the current when rounding these islands. Natives hostile and daring - -	285, 286
Sir Charles Hardy isles. Water. Tides. Cockburn reef and isles. Pollard and North channels. Directions. - - -	286-289
Margaret bay. Sunday ialet. Coast from Thorpe point to False Orfordness. Shelburne bay. Outlying islets and reefs between Shelburne bay and False Orfordness - - -	289-292
Coast from Orfordness to Newcastle bay. Dangers bordering the coast. Outlying islands and reefs. Dangerous patches westward of z. reef -	292-295
Newcastle bay. Dangerous shoals extending from Vallack and Fly points. Kennedy river - - - -	295, 296
Albany island. Albany rock. Mai, Tree, and Bush islets, and shoals connecting them. Mid rock, its dangerous position. Port Albany. Albany pass. Somerset. Water. Directions. Tides - -	296-299
York road. Evans bay. Water. Sextant rock - - -	300, 301
Cape York. York and Eborac isles. Directions. Tides - -	301, 302
Brothers rocks. South and North Ledge reefs. Mount Adolphus islands. Blackwood bay, supplies. Tides. Directions - -	302-305
Remarks on cape York - - - - -	305, 306

INNER ROUTE FROM CAPE MELVILLE TO CAPE YORK.

Cape Melville to cape Sidmouth. Caution - - - -	306, 307
Cape Sidmouth to cape Grenville. Strong current between capes Weymouth and Grenville. Caution - - - -	307
Cape Grenville to cape York. Caution. Current - - - -	307, 308

GREAT BARRIER REEFS FROM CAPE MELVILLE TO THE PARALLEL OF CAPE YORK.

Openings off cape Melville too far to the southward to be serviceable.	
No. 5. Sand-bank opening - - - - -	308, 309
First 3-mile opening. No. 8. Sand-bank. Second 3-mile opening -	309, 310
Southern small detached reef. Bligh Boat entrance. Hibernia entrance. Providential channel - - - -	310, 311
Northern small detached reef. Quoin entrance - - - -	311
Black rocks. Directions. Wreck Bay. Black Rock entrance. Safe entrance. Nimrod passage. Directions - - - -	312, 313
Single rock entrance. Stead passage. Yule detached reef. Directions	313, 314
The Barrier northward of Stead passage. 100-fathoms edge of soundings - - - - -	314, 315
Great detached reef. Raine island and entrance. Beacon. Supplies. Tides. Remarks - - - - -	315-317
Blackwood channel. Ashmore, Middle, and Tynemouth banks. Tides	318-320
Middle passage. Directions - - - - -	320
Pandora entrance. Directions. The Barrier from Pandora, to Olinda entrance. The Barrier from Olinda entrance to lat. 10° 40' S. -	320-322

CHAPTER VI.

TORRES STRAIT, INCLUDING THE WESTERN CHANNELS.—THE
NORTHERN TERMINATION OF THE GREAT BARRIER REEFS, AND
THE PAPUAN, OR GREAT NORTH-EAST CHANNEL.

	Page
Peak point. Coast between cape York and Peak point. a. rock direction mark for Prince of Wales channel. Endeavour strait - -	323
Eastern entrance. Possession island. Channel between Possession island and Peak point not navigable - - - -	324
Islands in the entrance of Endeavour strait. Dangerous Heroine rock and doubtful Gibson shoal. Tides - - - -	324, 325
Southern coast of Endeavour strait. Jardine river. Brady bank. Red, Barn, and Wallis isles. Inskip and Red banks. Tides - -	325-328
North side of Endeavour strait. Entrance island. Channel between Entrance and Woody isles. Cape Cornwall. Outlying dangers between Entrance island and cape Cornwall. Caution - -	328
Rothsay banks. Best channel through the western entrance of Endeavour strait. Soundings. Direction of the tide streams -	329
Directions from the eastward. Vessels of light draught may cross the Rothsay banks - - - -	329, 330
Directions from the westward. Disadvantages of Endeavour strait -	330, 331
Prince of Wales island. Horn island. Dangers lying eastward of Horn island. Wednesday island - - - -	331, 332
Flinders passage not navigable. Scott rocks. Chapman reef. Hannah and Nereid rocks. Directions - - - -	333
Hammond island and rock. Goode island and signal station. Waiweer. Ipili reef. Moneta shoal - - - -	334, 335
Thursday island and settlement. Friday island. Normanby sound, anchorage. Directions. Tides. Ellis channel. Directions. Aplin pass. Directions. Gerard and Larpent banks - - - -	336-339
Booby island, supplies for shipwrecked people. Post office. Tides. Banda reef - - - -	340
Double island. Marina and Edwards rocks. East Strait islet -	341
Prince of Wales channel the best through the western part of Torres strait. Sunk reef. Directions from the eastward, and from the westward. Tides. - - - -	341-343
North-West and South Torres reefs. Dayman channel. North Torres reef. Simpson channel. White rocks. Directions for Dayman and Simpson channels - - - -	343-345
Channel and Travers isles. Campbell reef. Caution. Hovell shoal. Yule channel. Directions - - - -	345, 346
Hawksbury island and reefs. West island. Duncan group. Long reef. Bramble channel. Directions - - - -	346-349
Mount Ernest and islets and reefs to the northward. Banks channel. Directions - - - -	349-352
Banks island and islets and reefs to the northward - - - -	353, 354
Mulgrave island. Savage character of the natives. Shoals extending to the westward from the island - - - -	354-357

	Page
Islets and reefs to the northward and westward of Mulgrave island	357, 358
Jervis island. Tides. Belle Vue islands. Passage islet. Orman reef	359, 360
Bligh channel, directions. Remarks on the Western channels through Torres strait. Caution	360, 361

GREAT BARRIER REEFS FROM THE PARALLEL OF CAPE YORK TO THEIR NORTHERN TERMINATION AT ANCHOR CAY.

The Great Barrier reefs from lat. 10° 40' S. to Yule entrance. Yule entrance. Cumberland passage	362, 363
Murray islands, character of the natives, tides. Directions	363-365
Flinders entrance, directions. East and Anchor cays	365, 366
Reefs outside the barrier. Boot reef. Portlock reefs. Pandora passage. Remarks	366, 367

PAPUAN, OR GREAT NORTH-EAST CHANNEL

Advantages of the Great North-east channel	367, 368
Bligh entrance. Bramble cay. Black rocks. Tides	368
Darnley island. Anchorage; productions; natives; tides. Dangers to the northward of the island	369, 370
Channel between Darnley and Murray islands	370
Islets and reefs in the Great North-east channel	371-376
Western side of the Great North-east channel. Bampton island; North entrance. Bristow island	376, 377
Warrior reefs and isle. Dungeness island and reef. Basilisk pass. Long island. Turtle-backed isle. Tides	377-380
Cap islet. The Brothers. Mourilyan and Hastings reefs	380, 381
Extent of the Great North-east channel; natives; soundings. Directions; tides. Remarkable difference in the appearance of the islets and reefs caused by the tides	381-386

CHAPTER VII.

WINDS AND CURRENTS.—DIRECTIONS FOR THE INNER ROUTE BETWEEN SYDNEY AND TORRES STRAIT.

Winds and weather; barometer	387-389
Currents: southerly set between Sydney and Moreton bay; indraught to be guarded against in south-westerly gales; limits of the southerly current	389, 390
Within the Great Barrier reefs the tides rather than currents prevail. Currents in the Coral sea	390

REMARKS ON THE INNER AND OUTER ROUTES FROM SYDNEY TO TORRES STRAIT.

Season of the year for proceeding from New South Wales by Torres strait to India	391
Merits of the two routes; Captain King's remarks. The season for making the passage by either route	391, 392

DIRECTIONS FOR THE INNER ROUTE, FROM SYDNEY TO TORRES STRAIT.

	Page
The charts a sufficient guide from Sydney to Sandy cape. Caution	392, 393
Curtis channel. Breaksea spit to Bustard head	393
From port Curtis to the Percy isles; space for standing off and on or heaving to, in thick weather. From Percy isles through Whitsunday passage to Gloucester island. Tides	393, 394
Capricorn channel; from Percy isles through the Outer or Eastern channel to Gloucester island	394, 395
From Gloucester island to Palm isles; caution	395, 396
From Palm isles to cape Grafton. From cape Grafton to Hope isles	396, 397
From Hope isles to Lizard island; night route from cape Tribulation to Lizard island	397
From Lizard island to cape Melville; night route	397, 398
Inshore passage by Look-out point. Tides	398
From cape Melville to cape Sidmouth; night route	399, 400
From cape Sidmouth to cape Grenville; due allowance to be made for the stream which sets round the Home isles; night route; anchorage	400, 401
From cape Grenville; for port Albany; for York road and Evans bay or for Blackwood bay; for Endeavour strait; for Prince of Wales channel	401-403

INNER ROUTE FROM TORRES STRAIT TO SYDNEY.

Vessels from India to Sydney generally went westward by cape Leeuwin	403
Inner route may be adopted with advantage from the north coast of Australia to Sydney, in the north-west monsoon	403
Directions; courses given for going northward to be followed in the inverse order, when going southward. Caution with reference to anchoring	403, 404

CHAPTER VIII.

OUTER ROUTE FROM SYDNEY TO TORRES STRAIT, WITH THE OUT-LYING ISLANDS AND REEFS OFF THE EAST COAST OF AUSTRALIA, AND IN THE CORAL SEA.

The decided preference given to the Outer route; best idea of the route to be gathered from the chart	405, 406
Lord Howe island. Anchorage. Supplies. Winds and weather. Tides. Ball Pyramid. Wheat-sheaf and Observation rocks	406-408
Elizabeth reef. Life-boat, anchorage, current. Tides. Middleton reef. Tides. Capel and Kelso banks. Doubtful dangers	408-412

ISLANDS AND REEFS IN THE CORAL SEA.

Extent of the Coral sea. Extent and general appearance of the Great Barrier reefs	412, 413
Swain reefs, the southern portion of the Great Barrier. Tides	413, 414

	Page
Reported Vine Horse-shoe shoal and David reef could not be found by Captain Denham - - - - -	414
Flinders passage. Trinity, and One-and-half mile openings - - -	415, 416
Openings off cape Melville. First, and Second 3-mile openings. Small detached reefs. Quoin entrance - - - - -	416, 417
Black rocks. Wreck bay. Black rocks entrance. Safe entrance. Nimrod passage. Directions - - - - -	417-419
Single rock entrance. Yule detached reef. Stead passage. Great detached reef - - - - -	419, 420
Raine island and entrance. Beacon. Supplies. Tides - - - - -	420, 421
Pandora, Olinda, and Yule entrances - - - - -	421-423
Murray islands. Flinders entrance. East and Anchor cays - - -	423, 424
Bligh entrance. Remarks. Tides along the Great Barrier reef - -	424, 425
Outlying dangers in the Coral sea. Cato islet, reef, and bank. Hutchison rock. Anchorage. Tides - - - - -	425-427
Wreck reef. Bird islet. West islet. Anchorage. Tides - - - - -	427, 428
Kenn reef. Soundings. Anchorage. Tides - - - - -	428-430
Frederick reef. Anchorage sound. Soundings. Tides - - - - -	430, 431
Saumarez reefs. Soundings. Tides - - - - -	431, 432
The Eastern reefs. South Bellona reefs. Tides. Middle Bellona reefs. Observatory cay. Anchorage. Caution. Booby reef. Tides. N. W. Bellona reef - - - - -	432-435
Dangerous ground. Henry Miller reef. Chesterfield reefs and islets. The Passage. Long island. Anchorage. Soundings. Tides. Long island passage. The Western barrier. Avon islets. Tides - - -	435-439
Bampton reef. Bampton island, anchorage. Renard island. Winds and weather. Tides. Fairway reef. Nereus shoal. Soundings - -	439-442
Mellish reef. Beacon. Soundings. Anchorage. Directions. Mellish cay. Tides - - - - -	442, 443
North-west reefs. Marion reef. Lihou reef. Observatory cay. Soundings. Tides - - - - -	443-445
Tregrosse islets. Coringa islets. Magdelaine cays. Willis group. South and Northern passages. Soundings. Anchorage. Tides - -	445-447
Diana bank, not found. Bougainville reefs probably no other than Holmes reef - - - - -	448
Osprey reef. Caution. Tides. Dragon bank. Flinders reefs. Malay reef. Herald's surprise. Herald cays. Holmes reefs - - - - -	449, 450
Outer route through the Coral sea. Eastern fields. Boot and Portlock reefs. Pandora passage - - - - -	450-452

DIRECTIONS FOR THE OUTER ROUTE, FROM SYDNEY TO TORRES STRAIT.

The navigator referred to the last chapter. From Sydney to the parallel of 24° and meridian of 157° E. Thence to Raine island - - -	452
Raine island entrance. General directions for making the Great Barrier reefs. Necessary precautions to avoid being near the barrier at night, or in the daytime with light winds. Anchoring - - - - -	452-454

CONTENTS.

xv

	Page
Directions for Raine island entrance and Blackwood channel. Northern passage. The seaman not to be alarmed at the cross sea when getting into soundings. Other channels may be used - - -	454-456
Openings between lat. 12° 30' S. and Raine island not to be refused if distinctly made out, with a commanding breeze - - -	456
Pandora entrance useful as a refuge entrance - - -	456, 457
Papuan or Great North-east channel, its advantages. Directions for making the entrance from the Outer route - - -	457, 458
Caution. Sounding. Glare of the sun - - -	458

FROM TORRES STRAIT TO SYDNEY BY THE OUTER ROUTE.

The passage rarely adopted. Should only be attempted in the north-west monsoon. Importance of making easting, after clearing Torres strait - - -	459
Supposed eastern termination of westerly winds, in the north-west monsoon - - -	459, 460
Directions. From Prince of Wales channel, or cape York by Raine island entrance, or by the Great North-east channel. From the Great Barrier reefs or Eastern fields, to proceed eastward and over the most frequented ground practicable - - -	460
Hauling to the southward from about the 156th meridian. Sighting Mellish cay. Clearing the detached dangers lying off the south-east extreme of the Great Barrier reefs. Closing intermediate passage reefs in daytime, to take fresh departure. Proceeding from Sandy cape to Sydney as directed by the inner route - - -	460

ROUTES BETWEEN AUSTRALIA AND CHINA.

Eastern route. Middle route - - -	461, 462
Western route. Torres strait route. Summary - - -	462-464

CHAPTER IX.

SOUTH-EAST COAST OF NEW GUINEA.—TALBOT ISLAND TO EAST CAPE.

Introductory remarks - - -	465-468
Coast from Talbot islands to Mowatta village. Talbot group. Tauan or Mount Cornwallis. Bristow island. Bampton island - -	468-470
Gulf of Papua. West coast low. Numerous river mouths. Inhabitants implacably hostile. Soundings - - -	471, 472
Fly river and islands comprising the delta, river available for vessels under 14 feet draught. Tides. Midge isles - - -	472-474
Prince river of considerable size, but obstructed by shoals at the entrance. George river probably a mouth of the Fly river - -	474-476

	Page
Cape Blackwood. Aird river, approaches full of shoals. Entrance island. Aird hill. Flats fronting the coast - - -	476-478
Directions for the west coast of Gulf of Papua. Caution. Tides -	478
Deception bay; shoals. Coast between Deception and Freshwater bays	479-481
Freshwater bay, convenient for watering. Albert mountains -	481
Coast from Freshwater bay to cape Possession. Cape Possession. Tides - - - - -	481,482
Owen Stanley range, extent. Mount Yule. Yule island. Hall sound	483,484
Cape Suckling. Beginning of New Guinea Barrier reef - -	484,485
Redscar head. Redscar bay. Towtou opening. Caution bay. Aplin island, anchorage. Caution. Fishermen island - - -	485-488
Barrier reef. Basilisk passage. Coast from Red cliff to Palli-Palli point. Port Moresby. Fairfax harbour. Directions. Walter bay. Round head, caution - - - - -	488-492
Mounts Astrolabe and Owen Stanley. Aspect. - - -	492, 493
Barrier reef. Round Head entrance, of easy access. Hood point. Coast from Caution bay to Hood point. Barrier reef. Coutance reef	493-495
Hood bay and lagoon. Macgillivray range. Marshall lagoon. Cheshunt bay. Cape Rodney - - - - -	495-498
Coutance isle. Barrier reef. Rodney entrance, clear of danger. Good anchorage within. Sandbanks bay. Cloudy bay. Colombier point. Robinson harbour - - - - -	498-500
Coast eastward of cape Rodney. Barrier reef. Grange isle - -	500
Owen Stanley range. Mounts Obree, Brown, and Clarence. Table and Amazon bays - - - - -	501
Toulon and Cette islands. Orangerie bay. Dufaure island. Numerous inhabitants. Islets and shoals. Anchorage. Mullens harbour -	502-505
Owen Stanley range; mounts Suckling, Dayman, and Simpson. Argyle bay. Eagle point. Port Dudfield. Roux isles. Isabel cove. Fyfe bay - - - - -	505, 506
Farm bay, probably good anchorage. Baxter harbour. Stacey island. South cape. Bertha lagoon. Cloudy mountain. ~ Catamaran bay -	507, 508
Coast eastward of Catamaran bay. Leocadie islands. Brumer islands. Supplies. Inferior anchorage - - - - -	508-510
Sunken Barrier reef. Inverary bay. Heath reefs and island. Blanchard island - - - - -	510-512
Dumoulin isles. Caution. Owen Stanley range - - - - -	512, 513
China strait and obstructing reefs to the north-eastward. Hayter island. Tides. Rocky pass - - - - -	513-516
Basilisk island. Fortescue strait - - - - -	517-520
Moresby island, Hoop-iron bay and anchorage. James bay. Glenton and Smith islands. Aspect. Tides. Pitt bay. Flinn bay and anchorage. Mudge bay and anchorage - - - - -	520-527
Grant islet. Shortland islet and reefs. Byron islets - - -	527, 528
North Foreland. Spike island, anchorage - - - - -	528
Milne bay. Discovery bay. Supplies. Aleford islets. Mount Killerton - - - - -	528-530
East cape. Anchor and Chain islets - - - - -	530, 531

CHAPTER X.

LOUISIADE ARCHIPELAGO.—D'ENTRECASTEAUX ISLANDS, AND
NORTH-EAST COAST OF NEW GUINEA.

	Page
Limits. Teste island and islets, anchorage, and tides. Bell rock.	
New Guinea. Barrier reef. Lebrun islets. Foolscap rock. Soundings.	
Suckling reef. Ouessant isle - - - - -	532-535
Sable islets. Kossman islet, firewood procurable. Long reef. Duperré islets. Bramble haven. Secure anchorage. Convenient for a temporary refit and obtaining fuel - - - - -	535-537
Jomard, Montemont, and Duchâteau isles - - - - -	537, 538
Calvados chain of islands. Anchorage only to the southward of the islands. Supplies - - - - -	538, 539
Real and Eddystone isles. Mewstone, Stanton, and Huxley isles - - - - -	539-541
Sharpe, Robinson, Kalouma, and Flat islands - - - - -	541, 542
St. Aignan island. Limits not determined. Joannet island and harbour. Treacherous natives. Brierly island. Yams procurable - - - - -	543-545
Sud-est island. Passage reef. Water. Piron island - - - - -	545-547
Bramble pass. Coral haven. A secure harbour but the approaches are intricate. Natives fierce, warlike, and treacherous. Directions - - - - -	547-549
Southern edge of soundings off the archipelago. Duchâteau entrance. Barrier reef. Smith and Johnston passes - - - - -	549, 550
Sud-est Barrier reef. Detached coral patches - - - - -	550, 551
Rossel island. Thickly wooded and natives cannibals. Cape Deliverance - - - - -	551-553
Adèle islet. Rossel reef - - - - -	553
Winds and weather. Directions for the south coast of New Guinea and Louisiade archipelago - - - - -	554, 555
Bentley island. Engineer group. Sandfly bay - - - - -	555-557
Bright reefs. Haszard islets. Laseinie islands - - - - -	558, 559
Bonvouloir islands and reefs. Blakeney and Hull islets - - - - -	560
Gallows reef. Lydia island. Gibbons island. Shoals. Obstruction islands. Flounder reef. Göschen strait. Tides - - - - -	561-563
Normanby island. Cape Ventenat. Anchorage. Natives. Cape Prevost. Winds - - - - -	564-566
Main route from south-east coast of Australia to Göschen strait - - - - -	566
Gibbons island route. Tides. Soundings. Natives - - - - -	567, 568

D'ENTRECASTEAUX ISLANDS.

Normanby island, cape Chesterfield, Duchess cove and islets. Sunken coral patches. Capes Deedes and Dawson. Anchorage. Water - - - - -	568-571
Dawson strait. Fergusson island, cape Mourilyan, soundings. Mount Kilkerran. Moresby strait - - - - -	571-573
Goodenough island, villages, natives friendly. Capes Watts and Rawlinson - - - - -	573, 574

NORTH-EAST COAST OF NEW GUINEA.

	Page
Coast from East cape to Basilisk point. Bentley bay, natives numerous and friendly. Cape Ducie - - - - -	575
Excellent point. Stirling range. Cape Frere. Bartle bay, natives. Goodenough bay, Mosquitoe islands, anchorage. The coast -	576, 577
Soundings. Ward Hunt strait. Tide. Cape Vogel. Coast from cape Vogel to Carrington point - - - - -	578, 579
Collingwood bay. Soundings. Hardy point. Porlock bay. Dyke Acland bay, soundings - - - - -	579-581
Cape Killerton. Holnicote bay, anchorage, natives appear to be treacherous. Cape Hunt, Traitors bay. Soundings - -	581, 582
Hercules bay, soundings. Luard and Layard islets. Deaf Adder bay	583, 584
Huon gulf, tides, Longuerue islands, Dumpling islets. Soundings. Kuper range - - - - -	584, 585
Parsee point, anchorage. The coast. Soundings. Cape Cretin. Fortification point. Soundings. Cape King William. Mount Cromwell. Wind and weather. Tides - - - - -	586-588
<hr/>	
TIDE TABLE - - - - -	589
TABLE OF POSITIONS - - - - -	590-595
INDEX - - - - -	596-629

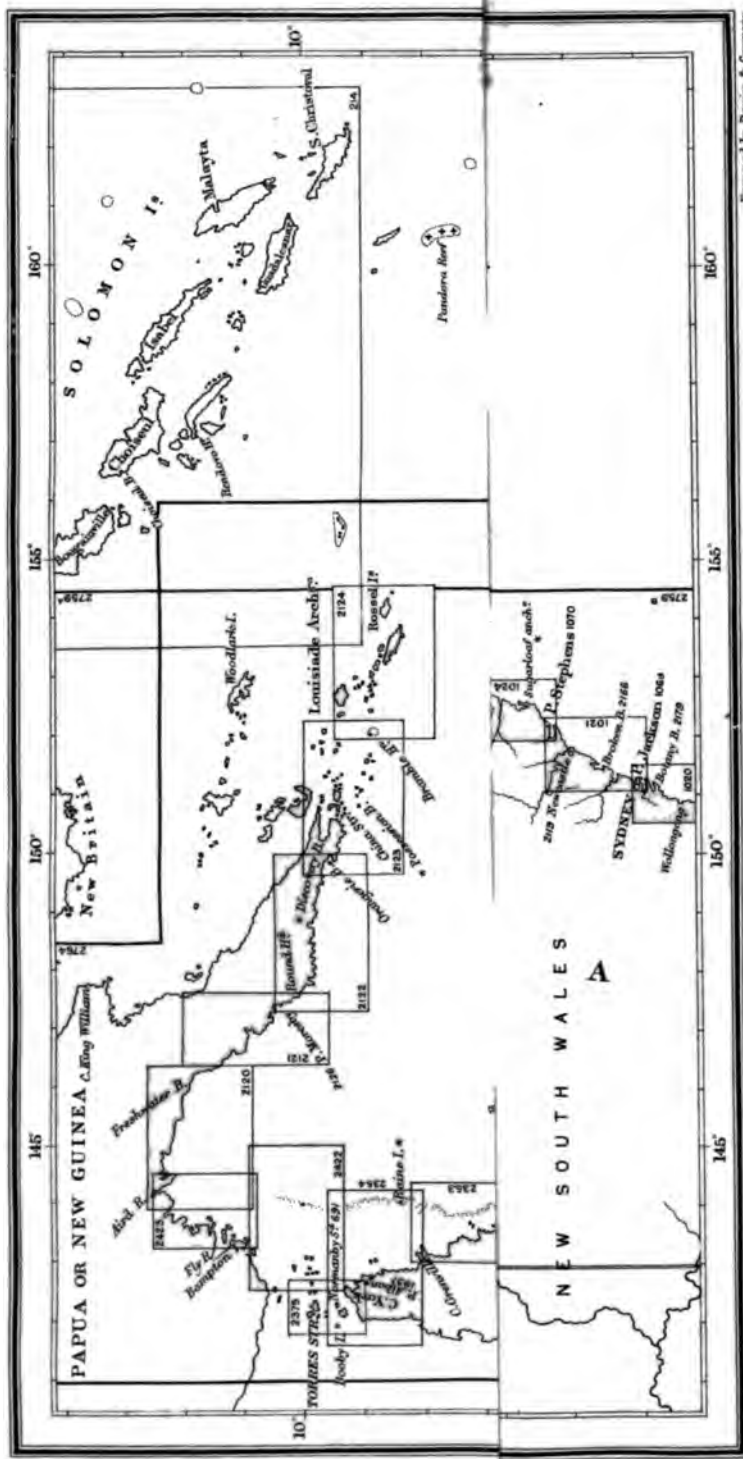
IN THIS WORK THE BEARINGS ARE ALL MAGNETIC,
EXCEPT WHERE MARKED AS TRUE.

THE DISTANCES ARE EXPRESSED IN SEA MILES OF
60 TO A DEGREE OF LATITUDE.

A CABLE'S LENGTH IS THE TENTH PART OF A MILE, OR 101' 26
FATHOMS, BUT ASSUMED TO BE EQUAL TO 100 FATHOMS.

INDEX TO
ADMIRALTY PUBLISHED CHARTS
ALLUDED TO IN THIS WORK

* indicates that a plan of the place is given upon the coast chart which is shown by the diagram to embrace it. A number against a place thus P. Jackson was shown that a separate plan is published bearing that number. A number and star thus: Sydney 249 * that a plan of the place is given on plate 249. ... for details of scales, prices, &c. see the published Admiralty Catalogue.



Engraved by D. & Co. 1870



the sterile table-topped cliffs which extend to the southward of the port ; and would, even if the lighthouse did not present a conspicuous feature, point out whether the land seen is to the northward or southward of the entrance of port Jackson.

OUTER SOUTH HEAD.—SIGNAL STATION.—

Outer South head is a precipitous projection of the coast, which here consists of coarse sandstone cliffs, of a light reddish colour ; the summit of the head is 300 feet above the sea. On the outer edge of the cliff, at about one quarter of a mile to the northward of Outer South head lighthouse, are a signal station and an electric telegraph office, communicating with Sydney. The pilots' look-out is kept at the signal tower, whence vessels' night signals for pilots will be answered by blue-lights.

Storm signals, *see* page 18.

LIGHT.—Outer South head lighthouse is a white circular stone building, 76 feet high, standing near the edge of the cliff, at one quarter of a mile to the southward of the signal station. It exhibits a white light, *revolving every minute and a half*, at an elevation of 344 feet above the level of high water, and is visible in clear weather, from a distance of 21 miles between the bearings of N. by W. and S. by W. $\frac{1}{4}$ W.

The GAP.—From Outer South head the cliffy coast-line trends N.N.W. $\frac{1}{4}$ W. one mile to Inner South head, which forms the rounding point on the southern side of the entrance of port Jackson.

Midway between Outer and Inner South head lighthouses the profile of the cliffs break down to a deep hollow and indentation of the coast, known as the Gap, which is so remarkable, that it has in a dark night even been mistaken for the entrance of port Jackson.

Gap bluff, a projection immediately to the northward of the Gap, rises to the height of 300 feet.

INNER SOUTH HEAD.—From Gap bluff the ridge gradually descends to Inner South head, which is 60 feet above high water, and has a lighthouse erected upon its extremity.

LIGHT.—Inner South head or Hornby lighthouse, which is intended for actual guidance into the harbour, after the more lofty Outer South head lighthouse has shown proximity, is a tower 30 feet high, painted *red* and white in vertical stripes, and built upon the edge of the cliff of Inner South head ; it shows a *fixed* white light, at the height of 90 feet above high water, and is visible in clear weather, from a distance of 14 miles, between the bearings of N.W. by N. and S.W. $\frac{1}{4}$ W. The light suddenly opens out from Gap bluff upon the former bearing, if coming from the southward, when abreast of, and $5\frac{1}{2}$ miles off Botany bay heads ; or upon the latter bearing, if coming from the northward, the light will open out

from Outer North head a little before the floating light appears, bearing S.W. $\frac{1}{4}$ W. By inclining a couple of reflectors, the light may also be thrown upon the South reef, at the base.

SOUTH REEF is a ledge of rocks extending nearly a cable to the northward from the base of Inner South head and is the only projecting spit to attend to between Inner South and North heads: it is easily seen in the daytime, by the sea constantly breaking upon it; and now that Inner South head is distinguished by a light at night, the head need only be given a berth of $1\frac{1}{2}$ cables to ensure clearing the reef.

The water is deep along the coast between Outer and Inner South heads, there being 14 fathoms at one quarter of a mile, and from 4 to 9 fathoms within a cable of the shore; but the cliffs are so precipitous as to afford no refuge in the event of shipwreck.

OUTER NORTH HEAD, on the north side of the entrance of port Jackson, is a table-surfaced, sharp-elbowed, perpendicular cliff, 242 feet high, N. by E. $\frac{1}{4}$ E. $1\frac{1}{2}$ miles from Outer South head signal station. The east coast of North head promontory is a high precipitous cliff, first trending from Outer head N. $\frac{3}{4}$ E. one mile, and then nearly N.W. three-quarters of a mile, to Cabbage Tree bay; this coast is also bold, there being from 4 to 13 fathoms water at a cable from the shore.

INNER NORTH HEAD, W. $\frac{1}{2}$ N. nearly three-quarters of a mile from Outer North head, is a projection of the clifly coast extending from Outer North head, and forms the north side of the entrance of port Jackson.

The **ENTRANCE** of **PORT JACKSON** is $1\frac{1}{2}$ miles wide, between Outer North and South heads; but the narrowest part, or what may be considered the actual entrance of port Jackson, lies between Inner North and South heads, where it is a little more than three-quarters of a mile across from cliff to cliff, N. by E. $\frac{1}{2}$ E. and S. by W. $\frac{1}{2}$ W.; but this breadth is reduced by a rocky spit on each side, to barely three-quarters of a mile. The entrance is clear of dangers, and the soundings are regular; the depth in mid-channel being 17 fathoms, sand. Although there is a depth of 9 to 12 fathoms within a cable of the northern shore, the sea generally rolls in and breaks heavily upon the cliff.

The **SOUND** is that part of port Jackson immediately within the entrance, and which branches off into Spring cove, and North, and Middle harbours. Although the Sound occupies an area of nearly $1\frac{1}{2}$ square miles, with regular soundings in 8 and 9 fathoms, it is too exposed to the ocean swell to afford safe anchorage, except with off-shore winds.

Spring cove and Quarantine Establishment.—From Inner North head the cliffs recede to the north-westward for about half a

mile, terminating at a hummocky point, upon which is the quarantine signal station: this forms the sheltering point of Spring cove, where 4 or 5 vessels, in moderate weather, may get into safe anchorage, to ride out quarantine. The quarantine establishment and burial ground are situated at about one quarter of a mile from the cliff, between Spring cove and Inner North head.

North harbour is a deep bight to the north-westward of Spring cove, with regular soundings of 6 to 8 fathoms, and, although not apparently open to the fury of south-east gales, it is a treacherous anchorage; but if a vessel, after running for Spring cove, finds its limited space so filled by vessels as to prevent her taking up a berth, she may anchor in 6 fathoms, at about one quarter of a mile to the northward of the north point of Spring cove, at a cable from the eastern shore, and in some measure be sheltered from the sea, which south-east gales send into the middle and western portions of North harbour.

Hunter bay and Middle harbour.—The first inlet which opens to view from the fairway track between Sydney heads, in a W. by N. direction, is the entrance to Hunter bay and Middle harbour, which is one mile within the heads and four-tenths of a mile broad, between Middle head and Grotto point. Nothing, however, should tempt a large vessel to enter Hunter bay when blowing hard from the eastward, as it is then a sheet of broken water, although with depths of from $3\frac{1}{2}$ to $4\frac{1}{2}$ fathoms; this would defy any ground tackle, and smother a laden craft, the draught of which might prevent her crossing the 9 feet bar, between Hunter bay and Middle harbour.

Middle harbour, which trends to the north-westward from Hunter bay, carries from 15 to 5 fathoms water for about three-quarters of a mile above the bar; when, after narrowing to a cable in width abreast of Hillery spit, it turns to the westward, into a 16-fathoms estuary, which branches into deep creeks, leading to no settlement or object except the firewood upon its banks, which some Sydney lighters find profitable for traffic.

MIDDLE HEAD, W.N.W. two-thirds of a mile from Inner South head, is a lofty, precipitous, bold bluff of whitish freestone, immediately facing the entrance of port Jackson. As it is exposed to the ocean swell, the sea breaks upon it with great violence during easterly gales.

WESTERN OBELISKS and LEADING MARK A.—On the western shore, facing the entrance to the Sound, are two obelisks, each 30 feet high: that nearest the sea is situated at the edge of the first elbow of the coast, immediately to the southward of Middle head; the western, and upper obelisk stands upon the wooded slope, and bears

W. $\frac{1}{2}$ S. from the former. These two kept in line, give the leading mark **A**, for clearing the South reef and the northern edge of the Bar and Flats.

Obelisk bight is a small bay midway between Middle and George heads.

George head bearing S. by W. $\frac{3}{4}$ W. three-quarters of a mile from Middle head is 209 feet high : a 3-fathoms shoal extends from George head one-quarter of a mile towards Middle head.

Bradley point, the southernmost projection of the north shore of port Jackson, lies S.S.W. $\frac{1}{4}$ W. nearly $1\frac{1}{4}$ miles from George head, and has a shoal spit extending about half a cable to the southward from it. Between George head and Bradley point are Chowder, and Taylor bays, separated from each other by Chowder head.

The BAR AND FLATS and SOW AND PIGS,* which extend across the actual mouth and threshold of the Sydney and Paramatta estuary, limit the capacity of the harbour to the admission of vessels of 20 feet draught in the western channel, at low water, springs, or 25 feet at high water in fine weather ; for if boisterous from seaward, or a gale is coming on from that quarter, the Bar is subject to a swell, which requires an allowance of a fathom scend.

The nucleus of this Bar consists of a group of rocks, showing at half tide, and marked by an iron beacon rod, surmounted by an open hooped ball. The beacon is fixed nearly midway between the shores on either side, and the outer and inner edges of the flats, which spread over two-thirds of a mile North and South, and extend from shore to shore across the entrance, which is here three-quarters of a mile wide.

Spits of rough ground extend S.S.W. one quarter of a mile, and S. by E. one third of a mile, from the beacon, with from 12 to 18 feet water upon them ; these, with a 16 to 17 feet ridge to the westward of them, form Sow and Pigs shoal, which separate East from the West channels. But there are two patches of 18 feet water lying respectively N. by E. $\frac{1}{4}$ E. $2\frac{1}{4}$ cables, and N. $\frac{1}{4}$ W. $2\frac{1}{4}$ cables nearly from the beacon, and which are the most dangerous shoals upon the Bar, as they lie in the fairway between the Sound and the light-vessel, and are open to the full scend of the ocean swell. These patches, which are the most shallow parts of the northern edge of the Bar, separate East from West channel, as the shoals just described to the southward, do in that direction.

SOW AND PIGS LIGHT-VESSEL, painted *red*, is moored in 21 feet water, to the north-westward of the shoals, and nearly one cable from the beacon. The light-vessel shows a *red* flag by day and two

* From the Survey by Lieutenant G. E. Richards, R.N., Commanding H.M. Schooner *Renard*, March 1878.

fixed white lights, placed vertically 6 feet apart upon one mast, by night. The upper light is 28 feet above the water, and visible from the north-eastward in clear weather, at the distance of 6 miles, bearing between S.W. by W. $\frac{1}{4}$ W. and S.W. $\frac{1}{4}$ W.; the bearings being thus limited by Inner South head to the southward, and Outer North head to the northward.

Storm signals, *see* page 18.

WEST CHANNEL, which crosses the Bar and Flats on the western side of Sow and Pigs shoal, carries from 20 to 21 feet at low water, over a sandy bottom: the most narrow part of the channel is between George head and the west extreme of Sow and Pigs shoal, where it is not more than $1\frac{1}{4}$ cables wide between the 3-fathoms edges of the shoals. The light-vessel is situated so as to render this the available night channel, which may be taken without a pilot, in moderate and clear weather, by any one who has studied the plan and directions.

LEADING MARKS for clearing the shoals on either side of West channel:—

C.—New Wesleyan church spire at Woolomoloo (nearly on the site of Craigend mill), just open of Bradley point, bearing S.S.W. $\frac{1}{4}$ W. clears the 18-foot patches on the northern edge of the Bar and Flats, and Sow and Pigs shoals, on their western sides.

Watson Bay.—From Inner South head, the eastern shore of port Jackson trends S. $\frac{1}{4}$ W. half a mile to Green point, the north extreme of Watson bay. Parsley and Vacluse bays, which are separated by Vacluse point, are two small bights forming a southward continuation of Watson bay; the three bays having one common entrance, which is 4 cables across, S.S.W. $\frac{1}{4}$ W. from Green point to Bottle and Glass spit. Both points of the entrance are closely begirt with sunken rocks; and from Bottle and Glass spit, foul ground borders the shore for nearly half a mile to the south-westward, terminating at Shark point.

Watson bay is the life-boat, and pilot station; and as there is smooth anchorage, in 6 to 7 fathoms water, outward-bound vessels frequently anchor here, to wait for a fair wind.

The Obelisks, for leading into East channel over the Bar and Flats, will not come in sight until a cable and a half within Inner South head; then the northernmost will be seen at the high-water mark on Green point. The south-western, 25 feet high, stands on the south-east trend of Vacluse point, upon nearly the same level as that on Green point, from which it bears S. $\frac{1}{4}$ E., distant a little more than half a mile. These obelisks, constructed of whitish sandstone, are well brought out to view by the thickly wooded background, while their distance apart renders any deviation from the transit quickly perceptible. The south-eastern obelisk

chequered red and white, stands on the east side of Parsley bay, about 120 yards E.N.E. from the south-western obelisk.

EAST CHANNEL.—Now that the entrance of East channel across the Bar and Flats is defined by leading marks, with deeper and much smoother water (26 feet at low water having been obtained by recent dredging), it may be expected that this channel will be more frequently used;* but the necessity for suddenly hauling up at right angles when entering from seaward, with a south-east breeze, is occasionally disadvantageous to this channel. The outer narrows of East channel, where the soundings quickly decrease from 8 to $4\frac{1}{2}$ fathoms, lie between South reef and the north-easternmost 18-feet patch of Sow and Pigs shoal, forming the northern entrance of the channel, which is there nearly one quarter of a mile wide; the leading marks for, and through the centre of which are formed by the obelisks just described.

LEADING MARKS for East channel, and cross mark for the southern edge of Sow and Pigs shoal :—

B.—Vaucluse and Green point obelisks in line, bearing S. $\frac{1}{4}$ E., lead into the northern entrance of East channel. This line however passes but just westward of the shoal off Lady bay, in 19 feet (low water).

D.—The obelisk on Green point in line with the chequered red and white obelisk east side of Parsley bay, bearing S. by E. $\frac{3}{4}$ E., leads nearly in mid-channel through the northern entrance of East channel, in 26 feet at low water.

F.—St. James's church spire its breadth open of Bradley point, bearing S.W. $\frac{1}{4}$ W., leads clear of the south-eastern 17-feet elbow of Sow and Pigs shoal.

E.—Outer South head lighthouse, its breadth open to the southward of the chequered red and white obelisk, east side of Parsley bay, bearing S.E. by E. $\frac{3}{4}$ E., shows that the south-western, or inner edge of the Bar and flats has been passed.

Port Jackson above the Bar and Flats is so free from dangers, and is so clearly represented on the plan, that a few of the islands and most prominent points, bordering the thoroughfare, need now be only briefly noticed.

Shark Island is small and thickly wooded, of moderate height, and lies E. by S. $\frac{1}{4}$ S. two-thirds of a mile from Bradley point; a spit of foul ground extends nearly a cable from its north-west end.

Clarke Island, S. by W. $\frac{1}{4}$ W. two-thirds of a mile from Bradley point, is similar in aspect to Shark island, but much smaller; and the water is deep around it:

* Dredging is in progress in East channel (December, 1878,) and it was intended that a depth of 27 feet should be obtained throughout. Navigating Lieutenant Penn, H.M.S. *Sappho*, 1878.

GARDEN ISLAND, which lies nearly one mile to the south-westward of Bradley point, is considerably larger and higher than the others : it may be approached, northward, to half a cable ; but a shallow spit runs out from its south point. Garden island is, with certain ordnance reservations, appropriated to naval purposes. It affords a quiet spot for astronomical and other observations. The slab for observing upon is in lat. $33^{\circ} 51' 54''$ S., long. $151^{\circ} 14' 47''$ E., from which the true bearing of Outer South head lighthouse is N. 82° E.

FORT DENISON and LIGHT.—Fort Denison, formerly called Pinchgut islet, lies about one quarter of a mile to the north-westward of the north end of Garden island. This islet, unlike the others just described, is a mass of bare rock and masonry, with a martello tower on its north-east extreme, which shows a *fixed red* light, for the more especial purpose of guiding steam vessels and coasters. Vessels from foreign ports are forbidden by the port regulations to pass this lighthouse until boarded by the health officer and other authorities. There is deep water around the islet ; but it should not be passed within half a cable, on account of two small spits extending out a short distance from it.

FORT MACQUARIE.—GEOGRAPHIC POSITION.—Fort Macquarie, from which the longitudes of the recent surveys of the coasts of Australia and New Zealand have been measured, is in lat. $33^{\circ} 51' 42''$ S., and the longitude considered to be $151^{\circ} 14'$ East of Greenwich. The fort is situated at the north extreme of the point which separates Farm cove from Sydney cove. (Shoal water runs out about a cable from the point, the spit being marked by a red buoy.)

MAN-OF-WAR ROAD and FARM COVE.—The custom of the port reserves Farm cove for the anchorage of men-of-war ; but, as four large vessels could not berth in Farm cove, Man-of-war road may be considered to extend from fort Macquarie to Garden island, as merchant vessels scarcely ever need, and are not expected, to anchor within that space.

Farm cove lies immediately to the eastward of fort Macquarie, and directly in front of Government house : it affords good anchorage in 7 fathoms, muddy bottom, with fort Macquarie point and Dawes point in line, bearing W. by N. $\frac{1}{4}$ N., and Government house S.W.

Moorings.—Two sets of moorings are laid in Farm cove for the use of H.M. ships.

Water.—There is a small camber for boats, inside a jetty on the west side of Farm cove, at about half a cable from fort Macquarie, with a turncock jet of excellent water at the end of the jetty, at which Government boats can, without charge, water at all times of tide ; and by warping vessel in, properly managed hoses might be led from the turncock direct into the tanks.

Kiribilli Point, the most prominent projection of the north shore of port Jackson, to the westward of Bradley point, lies N.N.E. one-third of a mile from fort Macquarie, and nearly in line with Bradley point and Outer South head lighthouse. A rocky spit extends half a cable from Kiribilli point, which, with fort Macquarie spit, reduces this part of the harbour to one quarter of a mile in breadth.

Careening Point and Great Sirius Cove.—The former is a high, narrow tongue of land, extending from the north shore to the centre of the bay, between Bradley and Kiribilli points. Great Sirius cove is a deep narrow creek running up nearly two-thirds of a mile on the eastern side of Careening point, at the head of which is a heaving-down establishment.

The **FAIRWAY** of port Jackson may be divided into three sections: the first, W.N.W. $1\frac{1}{4}$ miles from the line of the Outer heads; the second S.S.W. $2\frac{1}{4}$ miles across the Bar and Flats and up the sea reach to abreast of Bradley point; and the third, which is the harbour reach to Sydney cove, W. $\frac{1}{2}$ S. $1\frac{1}{4}$ miles, being but a run of $5\frac{1}{4}$ miles altogether, and which, at an eight-knot rate, is to be accomplished, against the ebb, in three-quarters of an hour, and in half an hour with the flood stream.

The first reach, and East and West channels across the Bar and Flats having already been described, the second reach, thence to abreast of Bradley point, and the third reach now remain to be noticed.

The average breadth of the harbour between the Bar and Flats, and Bradley point, is about half a mile; the soundings in mid-channel ranging from 7 to 16 fathoms, with sandy bottom. Between Bradley point and Shark island, the working room is nearly half a mile, allowing for the rocky spits which project about a cable on either side. Shark, Clarke, and Garden islands may be considered as forming the southern boundary of the fairway channel; but in working, vessels may advantageously make longer boards to the southward, between the islands, towards Rose, Double, and Rushcutter bays. They may also, when past Bradley point, stand to the northward on either side of Careening point, which will afford from two-thirds of a mile to nearly half a mile working room, merely keeping about half a cable clear of the spits extending from the points, to the westward of Bradley point. There is easy anchorage, in 10 fathoms, anywhere in mid-channel, and no tide stream to prevent a smart vessel, under a top-gallant breeze, turning to windward.

The ship channel, at about one-third of a mile above fort Denison, whether leading to Sydney cove, Darling harbour, or to Waterview, or Cockatoo island, is contracted to about one quarter of a mile in width between the points, the narrowest part being between the spits extending from fort Macquarie and Kiribilli points.

It is not here deemed necessary to enter into a detailed description of port Jackson above fort Macquarie, as a vessel having arrived thus far, will be berthed by the Portmaster's directions, according to her destination; and the various commercial localities, and other details of the kind, will be best understood by reference to the Plan.

ANCHORAGE.—The Sound only affords temporary anchorage with off-shore winds, to the northward of the Bar and Flats, where vessels may wait for a steam-tug, or for a favourable opportunity for crossing the Bar and Flats. But there is good anchorage in Watson bay, and immediately to the south-westward of Sow and Pigs shoal; and, should a vessel be baffled or assailed by those crippling gusts locally known as southerly bursters, or get perplexed as to threading her way amongst the shipping, she can find good anchorage, in not more than 13 fathoms, with good holding-ground, anywhere in the harbour reach, by merely giving the islets and points a berth of 2 or 3 cables. At night, when anchored in the way of passing vessels, a light is required to be shown.

Few harbours possess so much room with smooth water as port Jackson, from its branching into numerous arms and deep inlets, with steep projecting points between them; almost every yard of shore presenting a natural wharf.

The localities where wharves and stages have been constructed which admit of cargo being rolled in and out of a vessel, are Sydney cove, with 1,300 yards of berthage; the bight between Dawes and Miller points, 4 cables; and along the eastern shore of Darling harbour, about a mile of shore, which by simple staging, without the expensive aid of docks or basins, admit of shipping accommodation, in from 18 to 20 feet, at low water. The approaches to berths, and the process of berthing, are equally simple, and these being entirely the business of the pilot and Portmaster, no directions are necessary on that head.

DOCKS, SLIPS, and CAREENING Establishments.—Every facility is to be obtained at Sydney for repairing vessels of any size or description, with abundant supplies and stores of every kind.

Fitzroy Dock is the Government dry dock at Cockatoo island, about 2 miles above Sydney cove. The dock is 365 feet long, and 70 feet wide at the entrance, with a depth of 20½ feet over its caisson-sill, at high water, springs, and 19 feet at neaps.

The establishment is provided with large and recently improved machinery, but all warps and necessary labour for docking must be provided by the ship about to be docked.*

* Staff-Commander T. H. Tizard, H.M.S. *Challenger*, 1874.

Morts Dock is a private dry dock in the bight of Waterview bay, on the south side of the harbour, at about $1\frac{1}{2}$ miles above Sydney cove. This dock is 345 feet long and 69 feet wide at the entrance, with a depth of 19 feet at high water, springs, and $17\frac{1}{2}$ feet at neaps, over its sill; like Fitzroy dock, it is pumped out by a steam-engine.

Floating Dock.—There is also a floating dock capable of receiving a vessel of 250 tons.

Pymont Patent Slip, at Darling point, on the western side of Darling harbour, belongs to the Australian Steam Ship Company. It is 850 feet long, 400 feet of which incline beyond low water mark into 28 feet depth, and it carries a cradle 190 feet long, upon ways 36 feet wide. The engine power is capable of hauling up a vessel of 2,000 tons in 5 hours.

Towns and Darleys Patent Slip is a smaller, but much used patent slip, situated on the eastern shore of Darling harbour. It is about 400 feet long with its extremity 15 feet under water, carrying a cradle 21 feet wide, and worked by an adequate engine.

Vessels are occasionally hove down to the wharves in Darling harbour, and likewise in Great Sirius cove.

Population of Sydney in 1875, was 75,945.

Steam-tugs.—There are steam-tugs at Sydney, which may be summoned by signal when required.

PILOTS.—The pilot station at Watson bay, is within half a mile of the signal station on the Outer South head, and the look-out is kept at the Signal tower, from which the night signals of vessels requiring pilots will be answered. Pilots are ordered to keep night watch on the cliffs for vessels approaching the harbour, and to answer any signal that may be made, by showing a blue-light.

Pilots' Steam Vessel.—A Government steam vessel will be moored in Watson bay during bad weather to take pilots off to vessels making the port. If the state of the sea will not admit of a pilot being put on board from the steam vessel, she will lead the way into smoother water between the heads, where tugs will be in attendance.

Pilot Regulations.—Qualified persons, having received licences to act as pilots, are to board all vessels arriving off the heads of port Jackson, except such as shall have a white flag flying at the main-mast head which will denote the vessel to be by law exempt from the necessity of accepting the services of a pilot; and such pilots are to produce their licences whenever required so to do by the masters of such vessels. (3 William IV., No. 6, sec. 13.) The master of a vessel shall not be

entitled to claim exemption from the payment of pilotage, unless, when within one league of the entrance of any port or harbour, a signal be also hoisted in some conspicuous part of the rigging, according to the numeral pendant used for such purpose, indicating the port from which such vessel has arrived (11 Victoria, No. 15, sec. 3). The numeral pendant should be kept flying until the ship shall have anchored.

The master of every vessel not by law exempt from the necessity of accepting the services of a pilot is to place her in charge of the first licensed pilot that may come alongside; and such master is not to enter the harbour, or proceed to sea, or quit his anchorage without having a licensed pilot on board, under penalty equal to the amount of pilotage to which he would have been subject if a pilot had been employed. (3 William IV., No. 5, sec. 13.) The pilot who brings the vessel into port will be entitled to take her to sea.

There shall be payable and paid at every port at which there shall be a pilot establishment a pilotage rate upon every vessel, except as hereinafter excepted, of 4*d.* per ton on her arriving at, and on her departing from such port, and one moiety of such rate in any case of her being compelled to return into such port after having put to sea; provided that in respect of any such vessel the amount of such rate shall not be in any case less than 5*l.* for the port of Sydney, Newcastle, or Moreton bay, nor less than 2*l.* 10*s.* for any other port of the colony. (22 Victoria, No. 4.)

Exemption Flags and Lights.—The masters of all steam vessels coasters, or other vessels actually trading between any port in this colony and any other such port, or between any such port and any port in the colonies of Victoria, South Australia, Western Australia, Tasmania, or New Zealand, or on a whaling voyage, must, if wishing to claim exemption from the payment of pilotage under the Act of Parliament, 22 Victoria, No. 4, on arriving within three leagues of the port to which they are bound, exhibit a *white* flag at the main top-mast head, of not less dimensions than 3 feet at the hoist by 3 feet in the fly, and must keep the same flying until they have anchored in the port.

The pilot board may grant to the master of any vessel mentioned in the third section, a certificate of competency for any port or ports of the colony, upon being satisfied that such master is so qualified as to be entitled to such certificate; and there shall be paid to such board for every such certificate a fee of 5*l.* and no more.

Harbour Dues payable to the harbour master for repairing on board, and appointing the place of anchorage, for ships or vessels entering any port or harbour in New South Wales, and for each removal of the same from one place of anchorage or mooring to another, not being for

purpose of leaving the port (vessels registered in Sydney under 50 tons, or while employed in the coasting trade from one port of New South Wales to another, excepted) :—

			£	s.	d.
For every vessel under 300 tons	-	-	-	1	0 0
„ of 300 tons and under 400 tons	-	-	-	1	5 0
„ 400 „ 500 „	-	-	-	1	10 0
„ 500 „ 600 „	-	-	-	1	15 0
„ 600 „ 800 „	-	-	-	2	0 0
„ 800 „ 1000 „	-	-	-	2	5 0
„ over	-	-	-	3	0 0

CUSTOM HOUSE.—Masters of vessels arriving in port Jackson are informed that by the 13th section of the Act 9 Victoria, No. 15, they are required to give into the Custom House a true and proper account in writing of all dutiable goods, whether cargo or stores, on board their respective vessels, under a penalty not exceeding 100*l.* nor less than 10*l.*; and that by the 9th section of the same Act all goods liable to duty on importation, not duly reported, shall be forfeited. They are farther informed that, as great inconvenience has arisen from the careless way in which reports inwards have been frequently made, the law will in future be strictly enforced.

No goods, except personal luggage of passengers, may be shipped or unshipped from coastwise vessels at any place where any officer of customs shall or may be hereafter stationed, unless in the presence, or by the authority of the proper customs-house officer. (Victoria, No. 9, sec. 10.)

All goods, liable to the payment of duty, unshipped from any vessel without the duty being first paid or secured, to be forfeited, as well as any prohibited goods imported into the Colony, or any goods clandestinely removed after being warehoused, together with horses, other animals, and all carriages and boats used in their removal. (9 Victoria, No. 15, sec. 93.)

All vessels, the property of Her Majesty's subjects, trading from one port of the Colony to another, will be considered as engaged in the coasting trade. (10 Victoria, No. 9, sec. 2.)

Every person concerned in unshipping goods which are prohibited, or the duties on which have not been paid, or in concealing or illegally removing the same from the place of deposit, is liable to forfeit either three times the value thereof, or a penalty of 100*l.*, at the election of the officers of customs. (9 Victoria, No. 15, sec. 101.)

Every person obstructing an officer of the Navy on full pay, or any officer or officers of customs, or any person acting in his or their aid or assistance, or duly employed for the prevention of smuggling, such person being at

the time in the exercise of his office, is liable to a penalty of 100*l.* for every such offence; and every person so obstructing, with force or violence, any person so employed, is liable to be imprisoned for any period not exceeding three years. (9 Victoria, No. 15, sections 104 and 105.)

No vessel shall be entitled to her clearance at the custom house until the master shall have paid all the pilotage dues. (22 Victoria, No. 4, sec. 11.)

POST OFFICE.—The master of any ship or vessel arriving in the harbour of port Jackson, and every passenger or other person on board such ship or vessel, is bound to deliver on demand to the Postmaster General or port officer, or to any person duly acting for such Postmaster General or port officer, all mails, bags, boxes, packets of letters, or newspapers, and also all loose letters or newspapers which may be on board such ship or vessel, excepting always letters concerning goods on board such ship or vessel, and to be delivered with such goods and letters, containing any conveyance or other deed, commission, writ, or affidavit, and letters sent by way of introduction only, or concerning the bearer's private affairs.

The master or commander of any ship or vessel arriving in the harbour of port Jackson shall repair to the post office as soon after his arrival as shall be practicable, and shall then subscribe a declaration that he has, to the best of his knowledge and belief, delivered or caused to be delivered, to the person duly authorised to receive delivery thereof, every letter bag, package, or parcel of letters, or packets, except such letters as are exempted by law from postage.

If the master of any ship or vessel, about to depart from the Colony, shall refuse or wilfully neglect to receive on board such ship or vessel any mail or bag, or box of letters, or to give a receipt for the same, or shall refuse or neglect carefully to deposit such mail or bag or box in some secure and dry place on board of such ship or vessel, or to convey the same upon her then intended voyage, such master or person shall for every such offence forfeit and pay a penalty or sum not exceeding 100*l.* (15 Victoria, No. 12, sec. 37.)

If any master, commander, or other person having the charge of any steam-boat or other vessel proceeding, or about to proceed from any port or place within the colony to some other port or place within the same, shall refuse or neglect to receive any such post-office mail on board such steam-boat or other vessel, or to give a receipt for the same, being thereto required, he shall forfeit and pay a penalty or sum not exceeding 50*l.* (15 Victoria, No. 12, sec. 38.)

GUNPOWDER.—Vessels arriving with gunpowder on board, exceeding the quantity they require as stores, are to hoist an Union-jack at the main, and are not to proceed higher up the harbour than Neutral

bay until the gunpowder is landed according to law; and vessels taking gunpowder on board are not to do so, higher up than Neutral bay, under penalty in each case of 10*l*. (3 William IV., No. 6, Schedule A., par. 1.)

All vessels arriving with gunpowder on board are immediately to report the same to the Collector of Customs and Ordnance Storekeeper, the latter of whom is to grant a permit for the removal thereof to one of Her Majesty's magazines as early as possible. (7 William IV., No. 7. sec 2.)

All vessels are required to land at the Government magazine whatever gunpowder they have on board, whether as cargo or stores, before they enter Sydney cove or Darling harbour; and the master of any vessel in either of those places, on board which any gunpowder may be found, is liable to a fine not exceeding 1*l*. sterling for every pound weight of gunpowder so found; 12 hours after anchorage being allowed for landing such gunpowder, not exceeding 20 pounds in weight, as may have been brought up in such vessel as stores. (5 Victoria, No. 11, sec. 1; and 13 Victoria, No. 24, sec. 2.)

No gunpowder from any of the Government magazines is to be landed elsewhere in the harbour of port Jackson than at the point near Dawes battery, and such landing is to take place only between the hours of 6 and 10 in the morning, under penalty of 2*s*. for every pound weight landed or attempted to be landed. (19 Victoria, No. 6.)

All boats used for the conveyance of gunpowder are to be provided with tarpaulins, and to be properly housed over, under penalty of 10*l*. (5 Victoria, No. 11, sec. 2.)

All gunpowder so removed as aforesaid, is to be in packages or barrels closely joined or hooped, without any iron about them, and no one such package or barrel is to contain more than 100 lbs. in weight; and the said packages or barrels are to be so secured, that no part of the gunpowder can be scattered in the removal thereof; and in case of failure in this respect, the Ordnance Storekeeper for the time being, or other person duly authorized in that behalf, is empowered to remove the contents of the said packages or barrels into secure and proper packages, and to charge the expense attending the same to the importer or proprietor of such gunpowder; and the said Ordnance Storekeeper may refuse to deliver the gunpowder so removed into fresh packages, until such expenses are paid. (7 William IV., No. 7, sec. 5.)

Officers of Her Majesty's Customs may seize without warrant any gunpowder which may be found on board any ship or vessel contrary to law. (13 Victoria, No. 23, sec. 3.)

No gunpowder or other explosive material, or vitriol, or other such mineral acid, shall be shipped or delivered without a special notification to the Collector of Customs, nor without a plain brand or superscription, showing what material the package contains and the quantity thereof.

Any person guilty of a breach of this regulation shall be deemed guilty of a misdemeanor, and may be fined or imprisoned at the discretion of the court. (18 Victoria, No. 21.)

GENERAL REGULATIONS.—If any seaman or other person shall die on board any vessel in the harbour of port Jackson, the master of such vessel shall cause the body to be brought on shore and interred, under a penalty of not more than 20*l*. (4 Victoria, No. 17, sec. 22; and 7 Victoria, No. 21, sec. 6.)

Any person throwing a dead animal into any part of the harbour of port Jackson, to the westward of fort Denison, without attaching to it a sufficient weight to sink it, is liable to a penalty of not more than 5*l*.

Any person who shall throw or cause to be thrown any dead animal into any part of Sydney cove or Darling harbour, or shall leave or cause the same to be left upon the shores thereof, is liable to apprehension by any constable, and to be detained in any watch-house or other place of security until brought before a justice.

No ballast, rubbish, gravel, earth, stone, wreck, or filth is to be thrown from any boat or vessel in the harbour of port Jackson, or into any creek or river within the limits thereof, excepting only on land where the tide or water never flows, under penalty of not less than 5*l*. nor more than 10*l*.

Seamen.—No seamen shall be engaged to serve on board any ship or vessel for any voyage by any person other than the master or owner thereof; nor shall any seamen be so engaged except at the office, and with the sanction of the Shipping master of the port in which such engagement shall take place; and every such engagement shall be entered by the Shipping master in a register book to be kept by him for that purpose; and the seamen and the master or owner engaging him shall respectively sign their names in such book, in testimony of such engagement.

SOUNDINGS have been accurately ascertained within the range of the revolving light; and will prove a valuable assistance in nearing the land in thick weather. East of the entrance of port Jackson, at 18 miles off shore, the depth will be 100 fathoms, olive sand, from which it shoals regularly to 20 fathoms, close in with the land and with the entrance. To the northward of the port, 100 fathoms will be found farther off shore; and, on the contrary, to the southward, this depth does not extend more than 14 miles; the 100-fathoms edge of the sounding describing a serpentine line from lat. 33° 30' S., long. 151° 59' E., to lat. 34° 11' S., long. 151° 28' E.*

* An extensive bank with 20 fathoms water on it, which has been named Jerusalem bank, is reported to lie 40 miles from the land, and about the same distance south-east of the entrance to port Jackson, in lat. 34° 20' S., long. 151° 54' E.

WINDS and WEATHER.—From the early part of October to April, the coast in the vicinity of port Jackson, is subject to tolerably regular sea and land breezes, the former blowing from N.E., and the latter from the westward. The sea breeze generally begins at 10 A.M., and subsides after sunset; the land wind commences at about midnight, and continues until 8 A.M. The exceptions to this rule are north and south winds, which occasionally prevail, as do also the north-west hot winds; these latter, after blowing for a period varying in duration from 12 to 72 hours, are usually succeeded by sudden violent gusts from S.S.E. to S.S.W., which generally settle into a gale from those quarters, accompanied with rain. The greatest vigilance exercised by masters of vessels possessing local experience, is frequently insufficient to prepare for the suddenness with which these gusts overtake them; strangers, especially, should therefore be particularly careful to be ready for the change during the time when the hot wind is blowing, or the brief calm which sometimes intervenes.

From April to October, after the gales which usually succeed the autumnal equinox are over, and before those which generally precede the spring equinox commence, the wind prevails strong from the westward, between N.W. and S.W., with fine clear weather, and occasional gales from the North and South, with rain.

Except during the equinoctial gales, the wind rarely blows on shore with sufficient violence to endanger the safety of a well-appointed vessel; but in the spring equinox, when these gales set in from S.E. to East, accompanied with dense rain and a high barometer, they blow with great fury from 24 to 48 hours, and finish with a long, slowly declining gale from South to S.W.

The Barometer is, with local knowledge, of great assistance in showing the approach of bad weather; but it must not be implicitly relied on by strangers. As a general rule, the barometer stands low with westing in the wind; lowest with a north-west; high with easting in the wind; and highest in south-east gales.

The ordinary rotary changes of the wind are from North, veering to the westward; when the contrary is the case, such as from N.E. to East, and veering to the southward, bad weather may be looked for. After the strength of a south-west or southerly gale is over, the barometer will rise to about 30 inches, when fine weather and a gradual change of wind to the N.E. may be expected.

Fogs rarely occur, except in the summer months, and then seldom last longer than from day dawn to 10 A.M. When the sea breeze is blowing it is accompanied by a thin haze, which envelopes the land and renders it indistinct; this haze is dispersed as soon as the land wind springs up.

Storm Signals.—The existence of gales which are likely to endanger shipping will be signalled at the principal telegraph stations on the coast of New South Wales, in the following manner, viz. :—

The signal staffs will support two yards, which are to cross each other at right angles in the direction of the cardinal points of the compass, the yard-arms denoting respectively North, South, East, and West; midway between North and East will denote N.E., &c., &c.

A violent squall will be represented by a conspicuous diamond-shaped signal.

A heavy sea will be represented by a drum-shaped signal.

Gale, with clear weather will be represented by a diamond-shaped signal over a drum.

Gale, with thick weather and rain, will be represented by a diamond-shaped signal, and a drum over it.

The direction from which the gale is blowing will be indicated by the particular yard-arm between which and the mast-head the geometrical signal is suspended.

Place where squall or gale is blowing will be shown by hoisting the numerical flag, already in use at Sydney, Newcastle, and other coast stations.

Gales that are general over a large portion of the coast will be indicated by the geometrical figures without the mast-head flags.

At port Jackson the signals will be shown from the Sow and Pigs light-vessel, Bradley point and South head.

DIRECTIONS.—The most unfavourable times for entering port Jackson are in easterly gales, southerly gales, and light variable winds, with a ground swell rolling in upon the heads.

Easterly gales sometimes blow very hard, causing a heavy sea upon this coast, which not only breaks with great violence upon Sydney heads, but occasionally right across the entrance, and directly home to Middle head; a vessel, however, scudding in, must approach within 3 cables of Middle head, at the risk of being swept upon it by the hurling sea whilst hauling up, almost at right angles, to cross the Bar and Flats, and weather George head, upon which the sea breaks also. Easterly gales are frequently attended by haze-banks, which might prevent the lights being seen at night, until too late for a vessel to claw off the land; vessels should therefore, day or night, keep the sea rather than bear up for port Jackson in gale from the eastward, and should not approach the coast within 10 miles at which distance Inner South head light, if seen, will be dipping, and the soundings will be 70 fathoms, dark sand. It must be borne in mind, when getting an offing, that the weather gauge will be to the north-eastward the gale expends itself, and that in standing to the northward the vessel

safe as long as Outer South head light is not shut in by Outer North head, which it will be, upon the bearing of S. by W., and then the soundings will begin to shoal to about 20 fathoms, within which line no vessel should approach the coast.

The southerly gales are strong squally winds, which rush down the harbour, and frequently embarrass sailing vessels when working up between the heads, sometimes taking them aback, and exposing them to destruction against the North head cliffs; vessels should therefore wait outside until the wind becomes more steady, unless she is in very good working order and the flood stream is in her favour.

Vessels should not attempt to enter between the heads with light variable winds, as, under such circumstances, they frequently become unmanageable, and, being left to the mercy of the ground swell, may be set upon either head: therefore it would be advisable to anchor and wait for a steady breeze, or summon a steam tug, before getting too near the heads.

If a vessel bound to port Jackson should, from want of observations, be uncertain of her latitude, and fall in with the land either to the southward or the northward of it, in blowing weather, she may find shelter in Botany bay, to the southward, or Broken bay, to the northward, according to circumstances.

Vessels approaching port Jackson in the night, with southerly or westerly winds, should keep the sea until daylight; but with winds from the northward or eastward, and favourable weather, they may safely enter.

Botany bay, described at page 542 of Australia Directory, Vol. I., lies about 10 miles to the southward,* and Broken bay lies 16 miles to the northward† of port Jackson; and it is of the utmost consequence that such vessels as may happen to be in bad condition, and unable to keep off shore, should be aware of these useful places of refuge.

To ENTER PORT JACKSON from the SOUTH.

—When coming from the southward, if the weather be dark or thick, preserve a good offing until the Sydney heads or Outer South head lighthouse be seen, in order to clear the projection of the coast about Botany bay, where it is comparatively low, and where the currents sometimes sets S.W., towards the shore.

Having clearly made out the Sydney heads, and being abreast of Outer South head, if the wind be fair, steer to the north-westward, taking care not to bring Outer South head lighthouse to the westward of Gap bluff, in order to clear South reef; but, as the sea generally breaks upon it, it may easily be seen, and with a commanding breeze, may be passed in

* See Admiralty plan of Botany bay and port Hacking, No. 2,179; scale, $m = 2$ inches.

† See Admiralty plan of Broken bay, No. 2,166; scale, $m = 2$ inches.

8 fathoms, at a cable off. Soon after opening Middle head, to the northward of Inner South head, with the latter bearing S.W., pick up the leading mark A, by getting the two white obelisks on the western shore in line, bearing W. $\frac{1}{2}$ S., which will clear the South reef and the 18-foot patches on the northern edge of the Bar and Flats.

West Channel.—Steer in upon the leading mark A, until the new Wesleyan church spire is nearly in line with Bradley point, bearing S.S.W. $\frac{3}{4}$ W.; this will be the leading mark C, to which the course must now be altered, and this will lead through West channel, clear of Sow and Pigs shoal, passing at about $1\frac{3}{4}$ cables to the westward of the light-vessel. The soundings, when passing the 18-foot patches on the northern edge of the Bar and Flats, will decrease from 7 to $5\frac{1}{2}$, and then to $3\frac{1}{2}$ fathoms, which will be the depth until through West channel, when the water will quickly deepen to 10 fathoms, as Outer South head lighthouse opens its breadth to the southward of the red and white chequered obelisk below it (mark E), bearing S.E. by E. $\frac{1}{4}$ E.

The Bar and Flats being now cleared, steer S.S.W., passing between Bradley point and Shark island; round the point at the distance of about one quarter of a mile, to clear the spit extending from it, and then proceed westward for Sydney.

In working through West channel, the deepest water will be found on the western shore, with the exception of the 17-foot shoal extending north-eastward from George head, already mentioned. Avoiding this shoal, the western shore may be made free with to the distance of half a cable; but in standing over to the eastern side, northward of the light-vessel, the 18-foot patch on the northern edge of the Bar and Flats must be cautiously avoided, by not allowing the light-vessel to bear to the westward of S. by W. $\frac{3}{4}$ W.

Abreast of George head, West channel is contracted to little more than $1\frac{1}{2}$ cables' width by the 17-foot ridge forming the south-west extreme of Sow and Pigs shoal; to clear this, the obelisk on the south slope of the North head promontory must be kept a little open to the westward of the light-vessel, until Outer South head lighthouse is open at least its own breadth to the southward of the chequered obelisk below it, when the Bar and Flats will have been passed.

Vessels of heavy burthen, or drawing more than 18 feet, ought not, with a fresh wind, to attempt to work through either of the narrow channels across the Bar and Flats; but vessels of lighter draught than 14 feet can stretch right across from shore to shore, North of the light-vessel, passing over the 18-foot patches, on the northern edge of the Bar and Flats, and that portion of Sow and Pigs shoal lying to the southward of a line

from George head to the obelisk on Green point, which bear nearly East and West from each other.

A vessel of war, if bound for Man-of-war road, should, when abreast of Garden island, haul up between it and fort Denison, if proceeding to Garden island anchorage, when she may come to in 7 fathoms, with Inner South head lighthouse in line with the north extreme of the island.

For Farm cove, haul in between fort Denison and Lady Macquarie point, taking care not to close Outer South head lighthouse with the north bluff of Garden island, and anchor, in 6 fathoms, between fort Macquarie and Lady Macquarie point.

In proceeding to the Government dock at Cockatoo island, it is only necessary to keep in mid-channel, until off Balls head—about a mile above Sydney cove—where attention is called to a 19-foot patch, half a cable in diameter, lying in mid-channel between Balls head and Longnose point; to clear which to the southward, Dawes battery flag-staff should be kept a little open of the water-police station, at the north extreme of Goat island, taking care, after passing the patch, to avoid Longnose point by keeping Blues point just shut in by Balls head. Then, after clearing Longnose point, steer for Cockatoo island, at the south-east elbow of which is Fitzroy dry dock, denoted by the steam-engine chimney.

East Channel.—A vessel from the southward, able to lay a S. $\frac{1}{4}$ E. course, should pick up leading mark A, as already directed, and, proceeding on this mark, look out upon the port beam for the obelisks on Green and Vaucluse points; as these obelisks come in line—leading mark B—haul up for them S. $\frac{1}{4}$ E. carefully preserving their line for the first quarter of a mile; or Parsley and Green point obelisks in line bearing S. by E. $\frac{3}{4}$ E.—leading mark D—when the locking of Outer North, and Inner South heads will indicate being through the narrows. The vessel may now be edged off nearly a point from the leading mark, and when drawing in abreast of Camp cove, between Inner South head and Green point, steer S. by W.; taking care not to open the sea-mark obelisk on the south slope of North head promontory after once closing it with Inner South head, until St. James church spire is its breadth open to the southward of Bradley point—leading mark F—bearing S.W. $\frac{1}{4}$ W., which will lead clear of the south-east extreme of Sow and Pigs shoal.

By Night from the Southward.—A vessel from the southward being abreast of, or at about three-quarters of a mile to the eastward of Outer South head revolving light, with Inner South head fixed light well open of Gap bluff, bearing N.W., should steer N.W. by N. until Inner South head light bears S.W., by which time the floating light should be well open upon the bearing S.W. by W. $\frac{1}{4}$ W.; then steer West, which

will clear South reef and the 18-foot patches on the northern edge of the Bar and Flats, rounding the breakers on the former, at the distance of a cable, in 9 fathoms. When the floating light bears S.S.W. steer S.W. by S., passing at about a cable to the westward of the light-vessel; continue this course until Outer South head light bears E.S.E., when the Bar and Flats will have been passed, and the vessel may anchor in 9 fathoms with Outer South head light bearing E.S.E., and the floating lights N. by E.

Or, in fine weather, by keeping a sharp look-out, a vessel may proceed to abreast of Sydney, first steering S.S.W. until Outer South head light bears nearly E. by N. $\frac{1}{2}$ N., and the red light on fort Denison West; then steer West for the red light, which may be passed on either side, at the distance of a cable, and by bringing it astern in line with Outer South head light, bearing E. by N., the vessel will clear fort Macquarie spit, and may anchor in Sydney cove, in 7 fathoms, mud.

A vessel of war going to any part of Man-of-war road, should, from abreast of Bradley point, steer westward towards fort Denison light, and, when north of Garden island, haul in to the southward, between it and the fort, if bound for Garden island anchorage, which will be entered as soon as Outer South head light is shut in by the northern bluff of the island, bearing E. by N. $\frac{1}{2}$ N.

If bound for Farm cove, and any vessel which might be lying there can be discerned, proceed to the westward, between fort Denison and Lady Macquarie point, taking care in passing that point not to close Outer South head light with Garden island bluff; a good berth may then be picked up, in 8 fathoms, mud, with fort Macquarie bearing about West, and fort Denison N.E.

From the EASTWARD.—A vessel proceeding for port Jackson from the eastward, will find the latitude ($33^{\circ} 50' S.$) the best guide for making the port. When the heads are clearly distinguished, bring Middle head which faces the entrance, to bear West, and steer for it upon that bearing, until the Western obelisks, immediately to the south-westward of Middle head are made out; then get them in line, bearing W. $\frac{1}{2}$ S., and having thus picked up leading mark A, and cleared the South reef, haul up for crossing the Bar and Flats by West or East channel, as most convenient, and proceed as directed when entering from the southward, at page 20.

At night, as in the daytime, the latitude must be in great measure depended upon for making port Jackson from the eastward, until Outer South head revolving light, and afterwards Inner South head fixed light are distinguished. When Inner South head light first becomes visible, it appears dipping at the distance of about 10 miles from the land, the

soundings being 70 fathoms, dark sand, and when at about 5 miles off, the depth will be 50 fathoms, fine sand.*

When Inner South head light is distinctly visible, steer for it upon a West bearing, until Outer South head light bears about S.S.W.; then alter course to W. by N., so as to make sure of clearing the dangerous South reef; and when Inner South head light bears S.W., distant about one quarter of a mile, and the floating light is well open, bearing S.W. by W. $\frac{1}{4}$ W., steer West again, round the breakers on South reef at the distance of a cable, in about 9 fathoms water, and when the floating light bears S.S.W. steer S.W. by S., through West channel, passing at about a cable on the west side of the light-vessel. When Outer South head light bears E.S.E. the Bar and Flats will have been passed, and the vessel may anchor or proceed up the harbour, as directed at page 22.

From the NORTHWARD.—No especial directions are required for vessels proceeding into port Jackson from the northward in the day-time, as those already given for entering from the eastward, at page 22, will answer every purpose, taking care to give Outer North head a good berth, especially with a light wind and a ground swell.

At night from the Northward.—A vessel from the northward entering port Jackson by night, has merely to keep Outer South head light to the westward of S.S.W. $\frac{1}{4}$ W., to give her a half mile clearance to Outer North head, and looking out for the entrance, the quickly successive

* If, when running in upon a westerly bearing of Inner South head light, the land be too indistinct for cross bearings, the vessel's approximate position may be readily ascertained by a sextant angle, between Inner and Outer South head lights, the corresponding distance being found in the following table :—

Bearing of Inner South head light.	Angle between Inner and Outer South head lights.	Distance from Inner South head light.	Distance from Outer South head light.
W. by S.	° /		
	15 15	5 miles	5 miles
	18 45	4 "	4 "
	24 30	3 "	3 "
	35 00	2 "	2 "
	57 45	1 "	1 $\frac{1}{2}$ "
West.	15 00	5 "	4 $\frac{1}{2}$ "
	18 45	4 "	3 $\frac{1}{2}$ "
	25 15	3 "	2 $\frac{1}{2}$ "
	37 00	2 "	2 "
	65 00	1 "	1 $\frac{1}{2}$ "
W. by N.	14 00	5 "	4 $\frac{1}{2}$ "
	18 00	4 "	3 $\frac{1}{2}$ "
	24 45	3 "	2 $\frac{1}{2}$ "
	39 00	2 "	1 $\frac{1}{2}$ "
	73 00	1 "	1 "

opening of Inner South head light, bearing S.W. $\frac{1}{4}$ W., and the floating light S.W. $\frac{3}{4}$ W. will indicate the vessel being nearly a mile to the eastward of the North head promontory; and it is rarely so dark but that the black, towering North head will show when to steer W. by S. $\frac{1}{2}$ S., for the entrance between the heads, which should be done just as the floating light comes on with Inner South head, bearing S.W. by W. $\frac{3}{4}$ W., remembering that North head will be cleared as long as the floating light is not opened to the northward of Inner South head. Continue a W. by S. $\frac{1}{2}$ S. course, in not less than 9 fathoms, as South reef and the northern edge of the Bar and Flats are being passed, until the floating light bears S. by W. $\frac{3}{4}$ W., then steer S.W. by S. through West channel, passing at about $1\frac{1}{2}$ cables to the westward of the light-vessel. When Outer South head light bears E.S.E. the vessel may anchor, or proceed up the harbour, as directed at page 22.

WORKING into PORT JACKSON.—A westerly wind, although a leading wind across the Bar and Flats and up port Jackson, as far as Bradley point, blows right out of the entrance; but there is ample working room, for a well-handled vessel, between the heads, the shortest board being half a mile, between South reef and Inner North head; and, should it be ebb stream, it may be evaded by always tacking to the southward directly the light-vessel opens to the northward of Inner South head, until having worked up as close to South reef as brings the signal tower on Outer South head to touch Gap bluff, bearing S. by E. $\frac{3}{4}$ E., upon which line the vessel may stretch to the northward, clearing South reef at a cable distant, and then haul close up on the port tack, directly the light-vessel opens to the south-westward. Here the ebb stream will catch the vessel on the weather quarter; but as she reaches across towards the North harbour its strength, of $1\frac{1}{2}$ knots, will be avoided.

It should be here stated that immediately outside the Bar and Flats, the ebb stream sets to the north-eastward, towards Inner North head, and then E.S.E., along shore, towards Outer North head, leaving the space from the line of the Outer heads to Inner South head, in slack water during the ebb.

Caution.—To ensure success in working in, and to avoid mishap, smart working, and readiness with both anchors will be absolutely necessary to cope with flaws and gust of wind, as well as the ground swell, which perplex even those who frequent port Jackson.

TIDES.—It is high water, full and change, between Sydney heads, at 8h. 15m., springs rise 6 feet; and at Garden island at 8h. 30m., the rise at ordinary springs being 5 feet, and at neaps 4 feet.

Between April and October the night tides are higher than the day tides at Sydney, and between October and April the day tides are the higher.

In the offing, within the line of the currents, the ebb sets to the southward and the flood to the northward. Outside the Bar and Flats, as just stated, the ebb sets across the Sound, towards the Inner North head, and then about E.S.E. close along shore in the direction of the Outer North head, leaving all the space between the line of the Outer heads, and the Inner South head, in slack water, as regards the ebb stream. The ebb and flood streams set fairly across the Bar and Flats, N.E. and S.W., and up the harbour, partake of the mid-channel trends; the ebb from Shark island to the Bar and Flats setting N.E. and the flood S.W.; and above Bradley point the ebb stream East, and the flood West; the maximum rate of the ebb being 2, and of the flood $1\frac{1}{2}$ knots.

The COAST from port Jackson to port Stephens forms a slight bay, the north extreme of which (Stephens point) bears N.N.E. $\frac{1}{4}$ E. 80 miles from Outer North head of port Jackson. The outlying dangers are all within the depth of 20 fathoms, and the 30 fathoms line varies in distance from 3 to 9 miles from the shore. The land to the northward of port Jackson, between it and Broken bay, is high, with bluff heads, fringed by rocky ledges, and sandy beaches between, but with the exception of the reef running out from Long point, this part of the coast may be approached with safety to the distance of half a mile.

Current.—During the prevalence of north-east winds between the early part of December and the middle of March there is a southerly set along shore, and to the south-east in the offing, of nearly 2 miles an hour.

Long point reef.—From Long point, $5\frac{1}{2}$ miles northward of port Jackson, a dangerous reef extends one third of a mile; to avoid it keep Outer South head light open of North head, bearing S. by W. $\frac{1}{4}$ W.

BROKEN BAY,* 16 miles northward of port Jackson, is easily distinguished from the southward, Baranjo head, on the south side of the entrance, being a hill 310 feet high, at the north extreme of a narrow peninsula fronted by a reddish-coloured beach, forming the eastern boundary of Pitt water. At $3\frac{1}{2}$ miles southward of Baranjo head is a remarkable perforated cliff, known as the Hole in the Wall.

Coming from the northward, the entrance is more difficult to make out, cape Three Points—7 miles north-eastward of Baranjo head—projecting so far to the eastward, and the head, from that direction, being on with the high back-ground, is not easily distinguished.

Between cape Three Points and Hawk head, on the north side of the entrance, are East and West reefs, two small patches mostly awash, at half a mile from the land.

The entrance of Broken bay is 2 miles wide, between Baranjo and Hawk heads, both of which may be approached to 2 cables.

* See Admiralty plan, Broken bay, No. 2,166; scale, $\frac{1}{2}$ in. = 1 hes.

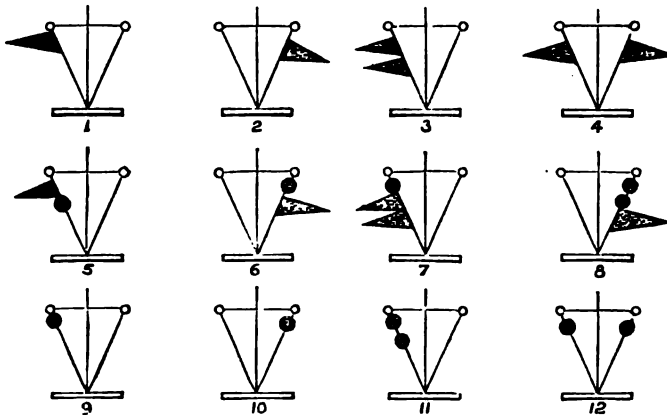
The anchorage in Broken bay is quite land-locked within Middle bank, and surrounded by rocky, scrub-covered hills, with trees growing in the ravines.

Eliot Islet, three cables long and 284 feet high, lies one third of a mile eastward of Middle head, and equidistant from Baranjo and Hawk heads; there is a narrow passage of 4 fathoms between the islet and Middle head.

The BAR.—Shoal water, upon which the least depth is $3\frac{1}{2}$ fathoms, extends two-thirds the distance from the southern shore towards Middle head, leaving northward of it a channel 2 cables wide of $5\frac{1}{2}$ fathoms, which extends nearly to Juno head. Between Middle bank and Juno head is a bar of not less than $3\frac{1}{2}$ fathoms, and which is connected with the south point of Flint and Steel bay by a narrow ridge of $4\frac{1}{2}$ fathoms.

The depth of $3\frac{1}{2}$ fathoms on the outer shoal lies in mid-channel N.E. by N. three-quarters of a mile from Flint and Steel point. Cape Three Points, open eastward of Eliot islet or Challenger point in line with Flint and Steel point, leads south-eastward in $3\frac{1}{2}$ fathoms.

Pilot Signals.—The following are the signals in use at all the bar harbours on the coast of New South Wales, north of port Jackson.



- No. 1.—You may approach with safety.
 „ 2.—Stand in.
 „ 3.—Stand in, the pilot has left to board you.
 „ 4.—If the pilot cannot board you, the boat will be inside the bar; steer for her.
 „ 5.—A boat will be sent off immediately.
 „ 6.—A boat will be sent off when practicable.
 „ 7.—The flood tide has commenced.
 „ 8.—The ebb tide has commenced.
 „ 9.—There is too much sea on the bar to send a boat.
 „ 10.—Stand off.
 „ 11.—It blows too hard to send a boat.
 „ 12.—The pilot cannot board you; stand off and on till the morning.

Note.—To be a red flag in each case.

The day signal for a pilot, to be made on board a vessel, is the union jack at the fore—and the night signal, burning a blue light, or firing a gun or rocket.

Care must be taken to prevent anything liable to be mistaken for a white flag being displayed, as a white flag at the mast head is the signal that a pilot is not required, the vessel being exempt by law from the compulsory necessity of taking a pilot. The following is an extract from the pilotage act, showing what vessels are exempt :—

“Vessels of all nations outfitting to, or refitting from the fisheries, and all vessels arriving and sailing in ballast, or which may not break bulk, or only to such an extent as may be necessary to provide funds for the repairs, refitting, or refreshments required. All ships, vessels and steamers, employed in the coasting trade, all ships or vessels trading between any port of New South Wales and any of the Australian colonies, or New Zealand, are exempt from pilotage, unless the services of a pilot have been actually required, and received.

“Every vessel that actually takes a pilot must pay full pilotage.”

Middle Bank, nearly mid-channel between Flint and Steel point and Juno head, is, within the 3 fathoms line, half a mile long and one quarter of a mile wide; the least water, $2\frac{1}{2}$ fathoms, is near the southern end. Between Middle bank and the shoal ground eastward, is a narrow passage of $5\frac{1}{2}$ fathoms leading into Flint and Steel bay.

Pitt Water, immediately within Baranjo head, is 5 miles long and from a half to one mile wide; there are depths of from 7 to 10 fathoms over the whole extent, but its entrance is closed by a bar from Baranjo head to Observation head. The shoalest part of the bar is on its southern edge, where not more than 10 feet will be found, within which it deepens suddenly to 7 fathoms. There are several coves in Pitt water, where vessels may conveniently lighten and careen. Wood and water may be easily obtained in various parts, and fish may be caught in all the sandy bays.

The custom house and pier are situated on the eastern side of the entrance close within Baranjo head.

Flint and Steel Bay.—Good anchorage will be found in 6 or 7 fathoms sand and mud, in Flint and Steel bay, 3 miles within Baranjo head, with Flint and Steel point, nearly in line with Middle head, bearing N.E. $\frac{1}{2}$ N., and Juno head W. by N. The holding ground is good, and the anchorage sheltered from wind and sea.

South-west Arm is considered the best harbour in Broken bay for large vessels; it is separated from Pitt water by a promontory formed of several rocky points, with steep high land over them, and some small

sandy bays between. Anchorage in $4\frac{1}{2}$ fathoms, will be found in Cowan creek, one mile within the entrance points; and in $2\frac{1}{2}$ fathoms in Refuge bay, immediately southward of Challenger head. To go higher up the arm keep nearly in mid-channel, where the least depth will be $4\frac{1}{2}$ fathoms for about 3 miles. There are some coves or inlets extending from this arm, with a good depth of water for vessels.

North-west Arm and Hawkesbury River.—To enter North-west arm, after passing Middle bank, steer for the western side of its entrance, and keep on that side for some distance, in order to avoid a shoal which extends about half way across from the eastern side, passing which, the channel, carrying a general depth of from 5 to 8 fathoms, turns north-eastward into a bay, and then to the northward and westward. This branch has several inlets of one quarter of a mile to half a mile in width, extending a considerable distance into the country; and Hawkesbury river, which flows into it from the westward, is navigable for vessels drawing 9 feet, upwards of 40 miles from its mouth. The river is 330 miles in length, being the largest on the eastern watershed of Australia, and although its banks are of considerable elevation, is subject to violent inundations during heavy rains, which are very destructive to the valleys through which it flows. The ebb stream generally runs tolerably strong in it.

Brisbane Water, is a sheltered but shallow arm of the sea, extending northwards from the bay between Hawk head and Eliot islet; vessels of 9 feet draft may enter by the channel which lies close along the eastern shore. In southerly winds the sea breaks heavily in the bay westward of the entrance.

A great deal of farm produce is sent to Sydney from the immediate neighbourhood of Brisbane water.

LIGHTS.—On Baranjo head are two white towers, 20 and 12 feet high, bearing from each other E.S.E. and W.N.W., and 390 yards apart, from each of which is exhibited a temporary *fixed* white light. Both lights will be eclipsed seaward between the bearings of North and N.N.W. $\frac{1}{2}$ W., to prevent their being seen over the land, which recedes from the outer South head, and also to ensure a vessel passing at a safe distance from the South head, by keeping the lights in sight when running for Broken bay. The lower or outer light will be lost sight of on rounding Baranjo head, but the upper light will be a good guide for coasters bound to Pitt water, or to large vessels seeking shelter in Flint and Steel bay. The inner and higher light is 347 feet, and the outer or lower light 315 feet above the sea; both lights are visible from a distance of about 6 miles.

TIDES.—It is high water, full and change, in Broken bay at 8h. 30m. ; springs rise 5 to 7 feet. The strength of the tidal streams at springs are ; at the entrance abreast Hawk head one to 2 knots ; off Flint and Steel point 2 to 3 knots ; in the entrance of Cowan creek, South-west arm, one to 2 knots ; and at the mouth of Hawkesbury river 3 to 4 knots.

DIRECTIONS.—Sailing into Broken bay, after passing Baranjo head, the south shore should be kept at the distance of about 2 cables up to Flint and Steel point, which being bold-to, may be closely rounded ; but baffling winds off the high land must be guarded against ; then steer for the anchorage, in Flint and Steel bay, or proceed on to South-west arm. The west point of Eliot islet in line with Flint and Steel point leads southward of Middle bank in $4\frac{1}{2}$ fathoms.

Working westward from Flint and Steel bay, and standing towards Middle bank, tack before the east point of Eliot islet comes open of Flint and Steel point. The south shore may be approached with safety, guarding against baffling winds.

Bound for the anchorage at the entrance of Hawkesbury river, when Juno head bears N.W. by W., the vessel will be clear of Middle bank ; then keep well over to the western shore, the best anchorage being in 7 fathoms abreast the second sandy bay with Croppy point N. $\frac{1}{2}$ W. and Juno head E. by N. $\frac{1}{4}$ N.

Entering by the channel along the northern shore, after passing Eliot islet and Middle head, keep the north extreme of the sandy beach immediately northward of Eleanor bluff—the south-western entrance point of Hawkesbury river—in line with Juno head, which leads north-westward of the outer shoal and Middle bank.

Working into Broken bay, the shoal patch of $3\frac{1}{4}$ fathoms, mid-channel between Middle head and Flint and Steel point, should be avoided.

The COAST from cape Three Points (view E. chart No. 1,021) trends N. by E. $\frac{1}{2}$ E. 39 miles to Nobby head, at the entrance of Newcastle harbour, and consists of rocky points and sandy beaches, backed by Tuggarah and Macquarie lakes, behind which the country is mountainous ; Warrawolong, an eminence N.N.W. $\frac{1}{4}$ W. 29 miles from cape Three Points, being 2,029 feet high. The points are skirted by rocky ledges ; but as none of them extend more than half a mile from the shore, this part of the coast may be approached to the distance of 2 miles, in from 27 to 20 fathoms, except that portion between the entrance of Tuggarah lake and Norah head which should not be approached within 3 miles.

Broken head.—About 25 miles from port Jackson, and 2 miles North of the first point of cape Three Points, is Broken head, a cliffy headland, with two distinct steep knolls ; a neck of low grassy land

connects it with the mainland. In the small sandy bight within it known as Terregal harbour, small vessels sometimes take shelter from southerly and south-west winds in about 4 fathoms, a cable off the beach.

Upright point is a steep cliffy-faced bluff extending N.N.E. one mile, its south end lying N. by E. 5 miles from first point of cape Three Points; at its northern end is a small sandy beach, and a good boat harbour among the rocks fringing the shore. A ledge of low-water rock borders the foot of Upright point bluff, about a cable distant, with 4 to 5 fathoms close to its edge.

Tuggarah reef.—The outer break of this reef in $4\frac{1}{2}$ fathoms, rock, lies E. by S. $\frac{1}{4}$ S. 2 miles from the entrance to Tuggarah lake, and S. by W. 5 miles from Norah head. There are 5 and 8 fathoms, with rocky bottom, within a distance of half a mile to the westward, and the ground from it to the shore is more or less rocky, with irregular soundings.

This dangerous reef is in the fairway of vessels, which in westerly winds keep inshore when traversing the coast, to avoid the current and have smooth water; the sea breaks heavily on the reef in bad weather, and has been seen to extend in one continuous sheet of foam to the shore. There is a channel inside it with deeper water, but it cannot be recommended, as the bottom is foul and rocky. Bird islet, kept open to the eastward of Norah head N. $\frac{1}{2}$ E., leads more than half a mile to the eastward of this danger in 20 fathoms water.

Eight-fathoms Patches.—South $2\frac{1}{2}$ miles from Norah head is a rocky patch with 7 or 8 fathoms on it, and S. by E. $\frac{1}{4}$ E. $1\frac{1}{4}$ miles there is another patch with 8 fathoms: there are 11 to 15 fathoms between these shoals which have been seen to break in bad weather from seaward. Table gorge, a remarkable gap in the mountain range between the Sugar Loaves and a flat-top hill South of them, bearing N.N.W. $\frac{1}{4}$ W., (view D. chart No. 1,021) leads eastward of these dangers.

NORAH HEAD, 14 miles from first point of cape Three Points, is low, covered with trees, and may be known from the eastward by a remarkable white sand patch, half a mile to the southward of it; the coast to the southward is rocky, and a low-water ledge of rocks extending $1\frac{1}{2}$ cables, fringes the shore. About the same distance E. by N. from the point situated on the low-water extreme, is a wedge-shaped rock, 15 feet high, and conspicuous from the southward. A ledge of rocks lies off the beach about $1\frac{1}{2}$ miles to the northward of the head, within which there is shelter for small vessels. About 5 cables N.E. by N. from the head is a rock showing 3 feet above high water, with one or two sunken rocks

always breaking half a cable westward of it. There are 10 and 11 fathoms close to on its east side, and between it and the point 5 and 6 fathoms.

On a small sandy beach, half a mile north-westward of Norah head, there is good landing for boats.

Bird Islet, which is 400 yards in extent and 175 feet high, lies one mile from the shore and $3\frac{1}{4}$ miles northward of Norah head, and is nearly midway between cape Three Points and Newcastle.

Catherine Hill Bay, is 5 miles North of Bird islet, and one mile North of Flat islet, which is 15 feet high. A coaling jetty runs out from the southern part of the bay, into about 13 feet at low water, and moorings are laid in 22 feet water for the convenience of vessels loading from the neighbouring coal mines. Two white posts have been placed on the shore, north-westward of the jetty, as leading marks to vessels. Entering the bay, bring the posts in line, bearing about W. by S. $\frac{1}{2}$ S., until the coal shoot on the jetty end is in line with the shed and mess house on shore, when the jetty and moorings may be steered for.

Moon Islet is a flat-top rocky islet 20 feet high; it is half a mile off the entrance to lake Macquarie, to which it acts as a breakwater.

Lake Macquarie.—There is communication kept up between lake Macquarie and Sydney by vessels of light draught. Coal of excellent quality is procured from a mine on the shores of this lake, and iron vessels are built expressly for the trade. There is seldom more than 6 feet at high water into the lake.

Between Moon islet and the main there is an 18-foot channel, by keeping close along inshore, skirting the low-water rocks, fringing South Lake bluff, but it is used only by the small craft trading to the lake, and which are thoroughly acquainted with the numerous rocks off the south-west tail of the islet.

HUNTER RIVER, the second in size of the rivers of New South Wales, is 300 miles long, and is navigable by large coasting steam-vessels to the town of Murrumbidgee 23 miles above Newcastle to which point the steam-vessels of the Australian Steam Navigation and Hunter river companies run. For 16 miles from the sea a depth of not less than 8 feet will be found under ordinary conditions, and the channels are buoyed and beacons. The general strength of the stream is from 2 to 3 knots. In the winter season the volume of water in the river is swollen by heavy rains, frequently causing disastrous floods in the valleys and low lands; at these periods the water rises considerably above its normal level, and the velocity of the stream is greatly increased. Maitland, with a population of 10,000, is situated on the Hunter, about 20 miles from the sea. Grapes are largely cultivated in the vicinity.

NEWCASTLE HARBOUR,* the mouth of Hunter river and formerly known as port Hunter, lies somewhat embayed between Norah head and Morna point, which lie respectively S. by W. $\frac{1}{4}$ W. 24 miles and N.E. by E. 18 miles from the entrance; but the coast is free from out-lying dangers, with from 13 to 22 fathoms water between 2 and 3 miles from the shore.

NOBBY HEAD,† formerly an islet—but now connected with the mainland to the south-westward, by a breakwater half a mile long—is the southern head and rounding point of Newcastle harbour, and lies in lat. $32^{\circ} 55' 15''$ S., long. $151^{\circ} 49' 15''$ E. It rises abruptly to the height of 92 feet above high-water mark, and its summit is surmounted by a white lighthouse.

LIGHTS.—Nobby head lighthouse, which is 34 feet high, exhibits a *fixed* white light, placed at an elevation of 115 feet above high water, and visible in clear weather from the distance of 17 miles, between the bearings of N. by E. and S.W. by W., being shut in to the westward of the latter bearing by Morna point.

As the shore forms a slight indentation between the entrance of Newcastle harbour and Morna point, it admits of the light being visible from a little westward of the bearing, S.W. by W.; but when so seen from a vessel, she would, if not actually on shore, be in very shallow water on a dangerous coast.

Two leading lights for the fairway channel are shown from towers on clear ground at the back of the town, and when in line are seen between two churches. The towers are 76 yards apart S.W. $\frac{1}{4}$ S. and N.E. $\frac{1}{4}$ N.; the upper tower coloured red shows a *fixed* white light, and the lower, coloured white, shows a *fixed red* light.

Also two leading lights for North channel, *red* and white, W. by N. and E. by S. 33 yards apart, are exhibited from the Bull beacons on the breakwater; the colours of the beacons being the reverse of the lights shown.

In both cases when in line the upper light will be *white*.

Signals.—The station on Nobby head has two signal masts, one on the north and the other on the southern side of the lighthouse.

The signals used at the bar harbours on the east coast of Australia, have at Newcastle been almost superseded by the Universal code, with the exception of the signals (*see* page 26), which are shown from the top-mast head of the flagstaff south of Nobby head lighthouse. Flood tide is indicated by a black ball above two flags; ebb tide by two balls above one

* See Admiralty plan, Newcastle harbour, with View, No. 2,119; scale, $m = 12 \cdot 0$ inches.

† A breakwater, extending north-eastward from Nobby head, is in course of construction.

flag. The flagstaff on the north side of the lighthouse is only used to denote ships in the offing, steam-vessels in the river, and health officer.

The coast storm signals are displayed from the flagstaff, near the harbour Master's residence, on Old signal hill.

Vessels having approached sufficiently near the entrance of Newcastle harbour to decipher the signals exhibited from the signal station, must pay strict attention to the instructions communicated by them, as it is impossible to get into the harbour against strong south, or south-westerly winds, and serious consequences are likely to befall a vessel attempting to enter the harbour in defiance of the requests made from the signal station.

Old Signal Hill, on which is the pilots' look-out station, the harbour master's house and two small beacons, is a hummock, rising abruptly to the height of 108 feet from the rocky ledge at the south-west end of the breakwater, and is distant about half a mile from the lighthouse on Nobby head.

A storm-signal flagstaff in communication with Sydney and the various ports and lighthouses on the coast, is erected on Old Signal hill; on a gale reaching the several stations, its force and direction is shown on the staff, the flags denoting the name of the port it has arrived at; its strength is indicated by signals similar to those in use at Sydney (*see* page 18).

A vigilant look-out is always kept from Nobby head, and from Old Signal hill, and vessels with the signals flying are promptly attended on by both pilot and tug steamer.

The Breakwater, which connects Nobby head with the mainland to the south-westward, tends to direct the tide stream through the entrance channel, and also to protect it from the surf and swell, which in a south-east gale render access to Newcastle harbour difficult and dangerous.

Pilots.—Masters of vessels are particularly cautioned not to approach too close to the port without having been first boarded by a pilot, and to cause the usual signal to be made, of hoisting a union jack at the fore.

Vessels requiring a pilot during the night, should keep well to windward off Nobby head and burn a blue, or flash-light, which will be answered by the watch at the pilot look-out station, on Old Signal hill.

Whenever the pilot is outside and in a good position, he will burn a blue light, when the vessel requiring a pilot should take the bearing and steer in that direction, showing a light for the pilot's guidance.

Tugs.—There are ten tugs employed for bringing vessels in and out, and moving them in the harbour; they are very efficient for these purposes, ranging from 180 to 40 horse-power; vessels approaching the port can obtain their assistance by exhibiting a chequered or weft flag. Except in heavy weather one or more of these vessels are outside the port.

Outer Ledges.—Rocky spits and foul ground project 2 cables' from Old Signal hill and from the next bluff to the south-westward; but those most in the way of passing vessels are the Outer ledges, which extend from Nobby head one-third of a mile to the eastward. A rocky spit also extends about a cable's length north-eastward from Nobby head, in line with the head and Old Signal station.

Big Ben Rock,* lies at the eastern extremity of the Outer ledges E. $\frac{1}{2}$ N. 3 cables from Nobby head, with the obelisk on the hill southward of the city of Newcastle, touching the north side of the harbour master's house bearing S.W. $\frac{1}{2}$ W.; there are 13 feet upon the rock, which breaks heavily in bad weather. A temporary iron buoy has been placed, in 28 feet water, near Big Ben rock.

Oyster Bank, an extensive flat of from 7 to 11 feet water extending in a N.N.E. direction nearly three-quarters of a mile from the north entrance point of the harbour; the outer part of the bank nearly always breaks.

Cawarra shoal lies on the northern side of the fairway channel N. by W. $\frac{1}{2}$ W., nearly 3 cables from Nobby head lighthouse. This shoal has been formed by the wreck of the steamer *Cawarra*, which foundered while endeavouring to enter the harbour during an easterly gale in July 1866.† There are 5 feet over the iron framework of the paddle wheels at low water. On the eastern side of the shoal is a green wreck buoy.

The two signal masts on Nobby head, or the two small beacons on Old Signal hill, in line, lead eastward of the Cawarra shoal, and Oyster bank.

Entrance Rock, with 13 feet water on it, is on the south side of the channel and but a short distance within the line of the leading marks, it lies nearly two-thirds of a cable off Boulder point, with Nobby head lighthouse E. by N. $\frac{1}{2}$ N. one quarter of a mile. A black perch lies on the northern low water edge of Boulder point.

The North Dyke, an embankment cutting off and forming the face of the north point of the harbour, is about 510 yards long in a N.E. and S.W. direction. At the western end of the dyke is the ballast wharf.

The general width of the channel into the harbour from abreast Nobby head is, between the 3 fathoms limits, about one cable, but at Entrance rock it is contracted to half a cable. The least water with the leading mark on is 21 feet with Nobby head bearing S. by E.

* It is contemplated to place beacons on Big Ben rock, and on the extremity of the ledge extending north-eastward from Nobby head.

† This was one of the heaviest gales known on the coast for many years, the wind veering from E.S.E. to E.N.E., barometer steady, 30·15 to 30·20 throughout its duration.

Buoys.—Two cables within the wreck buoy on Cawarra shoal is the red Fairway buoy in 26 feet, a little northward of the line of leading lights, with Nobby head lighthouse E.S.E. 2 cables; it may be passed on either side. A black buoy in 15 feet, marking the extreme of the shoal water, lies one cable N. by W. of the outer end of the loading wharf; a red buoy in 29 feet near the centre of the Horse Shoe, and two red buoys on the eastern edge of the shoal water fronting the town; there is also a white buoy on the eastern tongue of the shoal half a cable southward of the ballast wharf.

Moorings with buoy attached are laid down in 22 feet water nearly 200 yards off the breakwater, for the use of vessels bringing gunpowder or other combustibles for the magazine; they can swing into 12 feet at low water.

A bank of from 2 to 5 feet, 3 cables long and half a cable broad, lies in front of the town with a red buoy on its southern edge; between the bank and North channel the depths are from 7 to 12 feet, and southward between it and the coal wharves there is a narrow lane of water of from 10 to 20 feet.

Anchorage.—There is good anchorage in from $3\frac{1}{2}$ to $6\frac{1}{2}$ fathoms in the Horse Shoe, a space of about 2 cables in extent between the loading wharf and North Dyke; also in North harbour in $4\frac{1}{2}$ fathoms half a mile north-westward of the town.

North Channel, a narrow passage about half a cable wide, leading from the Horse Shoe to North harbour, lies close along the northern shore. Two patches of 11 and 6 feet lie S.W. $\frac{1}{2}$ S. two thirds of a cable, and one cable from the ballast wharf.

The Bull beacons on the breakwater, by day, or the red and white lights shown from the beacons, by night, kept in line, bearing E. $\frac{3}{4}$ S., will lead through North channel in not less than 17 feet at low water; passing northward of the white buoy on the east side of the 11 feet patch.

Entering the harbour at night great caution is necessary in consequence of the strength of the tidal streams, and due allowance must be made for the ebb or flood, when about to alter course from S.W. $\frac{1}{4}$ S. with the fairway lights in line, to W. $\frac{1}{4}$ N. the course through North channel.

Life-boats, are stationed at the Government boat harbour near the inner end of the breakwater.*

* There are two lifeboats stationed at the port under the control of a local lifeboat committee or trust, with an established crew of eleven men, who are paid and exercised once or twice a month. The crews have gallantly gone out on every occasion when required. The danger and risk at times is serious, as from the strength of the freshet setting out it is then difficult to get back to the harbour.

Dredge.—A powerful dredge is constantly employed deepening and removing obstructions in the harbour.

TIDES.—It is high water, full and change, in Newcastle harbour at 9h. 0m.; springs rise $3\frac{1}{4}$ to 5 feet. The tidal streams run 1h. 20m. after high and low water by the shore, at the rate of from 2 to 4 knots in the channel abreast Nobby head, and from 3 to 5 knots at the entrance between North Dyke and the breakwater.

DIRECTIONS.—The entrance of Newcastle harbour, as already noticed, lies somewhat embayed between Norah head and Morna point; vessels should therefore approach the harbour with extreme caution in southerly, or south-easterly gales, or when there are indications of approaching gales from those quarters; they frequently, however, come on without notice. Many vessels have been lost on entering this harbour, resulting nearly in every case through an endeavour to enter during a gale. If in these gales a vessel be unable to enter the harbour, from night coming on, or on account of the ebb stream, or other causes, she would be exposed to a dangerous lee shore to the north-eastward, on which the sea rolls heavily home, from a distance of 2 miles off the low sandy beach; under such conditions the vessel should keep a good offing or seek refuge in Broken bay or port Stephens (*see* page 25 or 40), according to the direction of the gale or other circumstances.

Strangers unacquainted with the navigation of Newcastle harbour, should not attempt to enter by day or night, without having first obtained a pilot, for whom the usual signal must be made as soon as it can be well seen, and in running down for the entrance at early dawn, an hour at least, from daylight should be allowed to enable the signal to be seen, and the pilot to get outside the entrance and board the vessel, before she approaches too close to the contracted channel which has to be navigated.

When it is unlikely that a pilot will board a vessel and take her into safe anchorage before dark, she should heave to well to the southward of the port—supposing the vessel to have a leading wind—and run down to the entrance at daylight, when she would be speedily boarded by a pilot. The risk to the vessel likely to be occasioned by endeavouring to pick up a pilot in the dark, will be thus prevented, and she will generally be in a better position for entering than if the crew had been employed all night in working to windward.

During south-easterly gales, when there is a heavy sea running, large ships should not approach too close, nor run for the harbour until a steam tug is in sight; when the tugs cannot get out, it is not safe for sailing ships to enter.

Care should be taken before going in, that both anchors and cables, boats and warps are ready for any emergency.

Vessels making for Newcastle harbour either by day or night, should endeavour to do so with the lighthouse bearing N.W. $\frac{1}{4}$ W., on which bearing and at the distance of 10 miles, soundings will be found in 60 fathoms, shoaling gradually to 30 fathoms at 5 miles off. With the wind having any southing in it, or in unsettled weather, vessels should not stand so far to the northward as to bring the lighthouse to the southward of West, by which they will avoid getting too close to the low sandy shore to the northward of the entrance of the harbour, a shore at all times to be avoided.

In the event of its being absolutely necessary from the disabled state of the vessel, or other circumstances, that the harbour should be attempted at all risks, the mariner is exhorted to endeavour to do so on the flood stream, as the velocity of the ebb, influenced by the freshets and other causes, is at times so great as effectually to stop a vessel's progress up the channels, added to which is the danger of being set on shore by eddies and the breakers, which in heavy gales, blowing along or on shore, extend right across the channel. When in the channel avoid as far as possible altering the course, to prevent the sea breaking on board.

To enter Newcastle harbour from the southward or eastward, a vessel may pass at about 2 cables distance from the outer ledges, lying to the southward and eastward of Nobby head, and which may always be distinguished by the sea breaking upon them; Big Ben rock the eastern point of these ledges lies, as before stated, with the highest obelisk over the city, touching the north side of the harbour master's house on Old Signal hill bearing S.W. $\frac{1}{4}$ W. The rocky spit projecting from Nobby head to the north-eastward may be passed at the distance of one cable, when the vessel must be prepared to haul up sharp to S.W. by S. to avoid being set on the Oyster bank, or north-west sands, the deep water channel being here little more than one cable wide, and the set of the ebb directly across these sands.

Having rounded Nobby head spit, the two light towers, the upper red and the lower white, will be observed on the high land above Newcastle; these kept in line bearing S.W. $\frac{1}{4}$ S., will lead, in not less than 20 feet water, sandy bottom, towards the Fairway or outer red mooring buoy, which lies W.N.W. 2 cables from the lighthouse, and which will be left to the northward. After passing this buoy the line of the leading mark must be carefully preserved as it passes close northward of Entrance rock, which lies $1\frac{1}{2}$ cables' length from the buoy S.S.W. $\frac{1}{4}$ W. The next will be the black buoy, lying on the edge of the shoal water off the east end of the loading wharf, and a little southward of the leading mark; it may be passed close to, when the vessel may anchor in the Horse Shoe about a cable within the buoy in 5 fathoms, or proceed through North channel to the upper part of the harbour.

Gales.—The easterly and south-east gales on this coast are always accompanied with incessant rains, flooding the low lands and causing strong freshets in the rivers. They raise a mountainous breaking sea at the entrance of the harbour, in a line from Big Ben rock, across to the eastward of the Oyster bank. This mass of breaking sea would of itself be sufficient to overwhelm ordinary sized vessels; but when, in addition, a freshet of 6 or 7 knots sets out of the river against this heavy easterly roll, to attempt to enter is almost certain destruction. It is therefore again to be impressed on seamen that, during a hard east or south-east gale with rain, which has lasted more than 24 hours, not to attempt to enter Newcastle, but either to keep to sea or make for port Stephens.

NEWCASTLE.—The city of Newcastle, situated on the slope of the high ground on the southern shore of the harbour, is the emporium for the vast fields of coal in the neighbourhood, and of nearly all the produce of the Hunter river district; the quantity of coal raised exceeding 1,000,000 tons annually.

In 1874 the number of vessels, exclusive of coasters, entered inwards was 1,156, of 510,291 tons; and outwards 1,269 of 543,693 tons. The total value of imports for the same year was 343,298*l.*; and exports 697,048*l.*

The city is well laid out and possesses many substantial buildings, and, from the character of its site, the mortality is low. Several of the streets are paved and lighted with gas, and the population, including the crews of the vessels, is estimated at 10,000. The Great Northern Railway terminates at Newcastle, and communication with Sydney is maintained by several lines of steam vessels.

Stockton is a suburb on the northern side of the harbour, facing the city.

Coaling Facilities.—Powerful steam cranes are worked on the Government wooden wharf on the south shore of the harbour, where vessels can load to 14 and 16 feet draught, above that, they must haul out to moorings in the Horse Shoe and complete to any draught under 22 feet by lighters. In addition to the cranes, there are four Government loading shoots, and five belonging to the Australian Agricultural Company, to the westward on the same shore of the harbour. At the latter shoots, 1,200 tons can be produced and vessels loaded daily to a draught of 14 feet 6 inches.

The Waratah company has a private railway and shipping staiths at the north end of Bullock island, 3 or 4 miles up Hunter river, and are enabled to ship from 1,000 to 1,200 tons of coal daily in vessels of light draught.

Other extensive works are in progress, which, when complete, will greatly increased facilities for the export of coal.

Repairs.—There is a patent slip at Stockton, capable of taking up a ship of 300 to 1,000 tons. The charge for taking up is 1s. per register ton. Rent 6d. per ton per day. Every description of repairs can be accomplished. There are also foundries attached to the port, where castings both of brass and iron are executed of the largest dimensions required, steam boilers and engines made and repaired, and skilled workmen employed.

On the wharf adjacent to the patent slip are a pair of sheers capable of lifting upwards of 30 tons.

Water, is supplied to shipping in the harbour by steam tanks from Tomago on Hunter river.

Port Charges.—Tonnage dues, four months from last payment, are 6d. per ton register ; the pilotage from or to sea being 4d. per ton register.

Vessels whose masters hold an exemption certificate need only pay one annual pilotage, which commences 1st April and ends 31st March the following year. Vessels under 300 tons, whose masters do not hold exemption certificates, pay the sum of 2l. 10s. each way, whether having the services of pilots or not.

For removal by pilots in the harbour :—

Vessels not exceeding 300 tons register, for each removal	-	20s.
" " 300 to 400 " "	-	25s.
" " 400 to 500 " "	-	30s.
" " 500 to 600 " "	-	35s.
" " 600 to 700 " "	-	40s.
" " 700 to 800 " "	-	40s.
" " 800 to 900 " "	-	45s.
" " 900 to 1,000 " "	-	45s.
" " over 1,000 " "	-	60s.

Towage is performed at the following rates :—

From sea, 7d. per ton register ; to sea, 3d. per ton register.

Removal by steam-tug in the harbour :—

Vessels under 200 tons register, for each removal	-	20s.
" 201 to 300 " "	-	30s.
" 301 to 500 " "	-	40s.
" 501 to 700 " "	-	50s.
" over 700 " "	-	60s.
" over 1,000 " "		by special arrangement.

Time Ball.—A time ball is dropped at the telegraph station every day (Sunday excepted) at one p.m., Sydney mean time.

The COAST from the entrance of Newcastle harbour to Stephens point, near the entrance of port Stephens, trends in a N.E. $\frac{3}{4}$ E. direction 23 miles; but a direct course between cannot be steered, as Morna point, 18 miles from Newcastle, extends beyond that line of bearing.

CAUTION.—The land between Newcastle harbour and Morna point forms a bay, with a low sandy shore, on which the surf at all times beats heavily, and a vessel may be lost in the rollers breaking in 10 to 12 fathoms, which in some instances extend to a distance of 3 miles from the shore. This must be particularly guarded against by vessels bound either to Newcastle or port Stephens. At the eastern part of this bay the land is of considerable height, and continues so to port Stephens.

MORNA POINT is a bluff hilly headland at the end of the long sandy beach, extending 18 miles north-eastward from Newcastle harbour. S.W. by S. three-quarters of a mile from its eastern point, and one quarter of a mile from the shore is Telegraph shoal, with 16 feet; Mount Stephens on Stephens point in line with Fingal head, bearing N.E. $\frac{3}{4}$ N. leads half a mile outside the shoal in 18 fathoms. S.W. by W. from Morna point $1\frac{1}{4}$ miles, and from 3 to 7 cables off shore, is a rocky patch of 4 cables in extent, with from $2\frac{1}{2}$ to 5 fathoms on it. Small craft beating to the northward and keeping inshore should be cautious when in the vicinity of these shoals; they both break in bad weather.

PORT STEPHENS* is a considerable inlet extending to the westward for about 11 miles with a breadth of from one to 3 miles; the eastern part for about 4 miles is much obstructed by numerous shallow sand-banks, portions of which are only covered at high water, but between them are deep and navigable channels leading to secure and landlocked anchorages. The entrance between Yacaaba and Toomeree heads, is two-thirds of a mile wide, and the least water in the deep part of the channel is $5\frac{1}{4}$ fathoms. Several streams run into the inlet, the principal ones being the river Karuah at its western head, and the Myall, which empties itself through the northern shore 3 miles within the entrance, and is the outlet for the large sheets of inland water extending parallel to the shore for nearly 25 miles.

In coming from the southward, the long sandy beach between Newcastle harbour and Morna point, and the islands off the entrance, are good guides for this port; and from the offing, the situation of the entrance will be easily discerned by the aspect of the land, which makes in conical detached hills. *Yacaaba head*, on the north side will be readily distinguished; and *Toomeree head*, on the south side, by its being the northernmost of four conical hills.

* See Admiralty plan, port Stephens, with views, No. 1,070; scale = 2.5 inches.

But the lighthouse on Stephens point so clearly marks the approach as to prevent any mistake, either by day or night.

STEPHENS POINT is a rocky promontory on the south side of the entrance of port Stephens, sloping down from its summit mount Stephens, which is 250 feet high ; and is fronted by rocky ground, upon which the sea breaks for one quarter of a mile eastward, and should not be approached nearer than a mile from the lighthouse about one cable within the south-east extreme of the point. The point is joined to the long neck of land, which extends from the entrance of Newcastle harbour, and forms the south side of port Stephens, by a narrow isthmus of bare sand, called Narrow gut.

LIGHTS.—The lighthouse on Stephens point in lat. $32^{\circ} 45' 10''$ S., long. $152^{\circ} 13' 20''$ E., is a white, circular, stone tower 70 feet from base to vane, and built on a knoll 66 feet high. From the lantern is shown, at 126 feet above the sea, a white and *red flash* alternately, *revolving every minute*, and is visible seaward at a distance of 17 miles, with the exception of a slight interruption by the islands off the entrance of the port.

The light affords a good guide for vessels seeking shelter in Fly road, between Stephens point and Toomeree head ; it is also a leading mark for entering between Toomeree and Yacaaba heads, as the light will not be shut in until it bears S. by E. $\frac{1}{2}$ E.

On Nelson head $1\frac{1}{2}$ miles within Toomeree head, a *fixed* light is exhibited, 175 feet above the sea, visible 8 miles ; the light shows white to seaward ; is eclipsed over Entrance shoal ; *red* northward of the shoal, and white up the harbour. As the glare of this light can be seen over the low land between Station peak and Toomeree head, care must be taken not to mistake this glare for the bright light as seen between Toomeree and Yacaaba heads.

Telegraph.—There is a station at the lighthouse, and a storm signal mast. Vessels are communicated with by Maryatt's and the Universal codes. There is also a station in Nelson bay.

Yacaaba or North Head is a peaked hill 756 feet high, with a steep and precipitous descent to the sea on all sides, except at its junction with the mainland, with which it is connected by a very narrow and low strip of sand, clothed with shrubs. Some rocks always visible and bold to, lie off the south-east point of the head, but its southern side is foul to the distance of one cable.

Toomeree, or South Head also rises abruptly to a conspicuous summit, at an elevation of 547 feet, with three equally conspicuous hills to the southward of it, all being separated from each other by low land.

Entrance Islands and Providence Bay.—Off the entrance to port Stephens there are three islands; the northernmost and largest, named Cabbage-tree island, 457 feet high, lies one mile north-eastward of Yacaaba head, and partly shelters Providence bay, the anchorage northward of the head, where vessels may ride securely during a southerly or westerly wind. The anchorage, however, in Fly road, between Toomeree head and Stephens point, is more convenient and safe should the wind veer to the eastward, as the port is under their lee. Little island, the outer and smallest, is 30 feet high and lies East $1\frac{1}{2}$ miles from Yacaaba head. Boondelbah, the southern island and 180 feet high, is E.S.E. $1\frac{1}{2}$ miles from the head; Boondelbah and Little islands are bare.*

Fly Road, between Stephens point and Toomeree head, offers a good stopping place during the strong winds, which frequently blow with great strength from the westward for two or three days together, particularly in the winter season, during which it is not easy to enter the port; the bottom is of sand and rather loose, but sufficiently good for an offshore wind. The best berth is in 11 fathoms, with the lighthouse bearing S.E. by S., and the hill next south of Station peak, West, at about half a mile from the shore. Small vessels may anchor near Narrow gut, as there is plenty of water within less than one quarter of a mile of the beach. If the wind falls light, or appearances indicate a change, the vessel should be immediately got under way, and run in without delay.

Entrance Shoal, a patch of 9 feet, nearly mid-channel, and one-third of a mile within the line of Toomeree and the inner part of Yacaaba head, lies at the end of a $2\frac{1}{2}$ fathoms spit stretching northward for half a mile from the west side of Toomeree head. From the shoal spot, upon which the ground swell frequently breaks, the extreme of Toomeree head bears S.E. $\frac{1}{2}$ E., a short half mile.

The entrance to port Stephens bears N.N.W. $2\frac{1}{2}$ miles from the lighthouse on Stephens point and West 2 miles from Boondelbah island; it is two-thirds of a mile wide, and the fairway channel occupies about one-third of the distance from the northern point.

Middle Ground, is the southern portion of an extensive flat occupying the greater part of the northern side of the port northward and westward of Nelson head, covering the mouth of Myall river and

* In 1843, Captain P. P. King, R.N., who surveyed port Stephens, wrote as follows :
 “ In calm weather the anchor may be dropped on the 7 fathoms bank, which is of considerable extent, and stretches northward from about a mile eastward of Stephens point
 “ to abreast of Toomeree, beyond which, on approaching the islands, the water deepens,
 “ During southerly or easterly winds, a heavy sea breaks over the bank.”

This bank was not found during the survey of 1866.

In 1876, Captain F. Hixson, President of the Marine Board, New South Wales, obtained several soundings in different positions on the alleged bank, but found not less than 23 fathoms water. The bank has therefore been removed from the Chart.

narrowing the channel between it and Nelson head, to a width of 3 cables. On the south side of Middle ground is a patch of shifting sand always visible, and a bank three-quarters of a mile long, which covers at high water, lies across the mouth of the Myall, with a narrow channel between it and the river.

Southward and westward of Middle ground, Manton bank, a detached narrow shoal of from one to 2 fathoms, forming the south side of Middle channel, extends for $1\frac{1}{2}$ miles to abreast Corlette head, with a small spot of 2 feet near its western end.

West Bank, near the centre of the large space of deep water westward of Middle ground, is about 3 cables in extent; the least depth is 4 feet, N.W. $\frac{1}{2}$ N. three-quarters of a mile from Corlette head.

South Channel, the deepest and most navigable passage to the western part of the port, lies southward of Middle ground, with a general width of 3 cables and depths of from 17 to $4\frac{1}{2}$ fathoms. Red patch rocks lie $1\frac{1}{2}$ cables off Red patch point, and the shore westward is shoal for one cable off.

Middle Channel, formerly the widest and most frequented passage, has become so contracted that it should only be taken by small vessels, with local knowledge. The channel is between Middle ground and the Manton bank southward, and the depths are from 6 to $3\frac{1}{2}$ fathoms.

The Narrows, about 7 miles within the entrance of the harbour, is the passage, half a mile wide, connecting the inner with the outer portion of port Stephens; Boandabah island lies in the centre of the passage, with Fly rock nearly 2 cables westward.

ANCHORAGES.*—In shoal bay, westward of Toomeree head, there is anchorage for small craft in from 2 to 3 fathoms. With the wind off the land, and while the water is smooth, vessels may anchor northward of Nelson head; but with any wind to the eastward of South, a heavy swell sets in, and during a south-east gale the sea breaks across the entrance, rendering the anchorage a very uneasy one and unsafe.

Nelson Bay.—This anchorage $2\frac{1}{2}$ miles within Toomeree head, is convenient for vessels, wind or weather bound. Coasters frequently take shelter in it during foul winds or bad weather, and it is also much frequented by whalers, being a convenient place to refit, and to procure wood and water; of the latter, 8 or 10 tons may be collected in a day. Anchor in 6 to 4 fathoms, out of the tide stream, off the centre of the beach, with the summit of Yacaaba shut in to the southward of Nelson head, so as to be within the range of the tide rippings and eddies.

There is a telegraph station in Nelson bay.

* The description of the anchorages and directions for port Stephens are principally from those published by Captain Philip P. King, R.N., in 1843.

Salamander Bay, 5 miles from the entrance, is a spacious and excellent anchorage, being well sheltered from all winds, the bottom is of good quality, and the depth from 6 to 9 fathoms. The best anchorage is between Corlette and Wanda Wanda heads, but the anchor may be dropped in any part of this portion of the port, remembering that where the channels become contracted the velocity of the stream is correspondingly increased.

There is another anchorage with depths from 5 to 12 fathoms in it, immediately westward of the Narrows, and extending about a mile to the southward and south-westward of Baromee point, which is nearly $1\frac{1}{2}$ miles westward of Boandabah island. The best anchorage is in 5 fathoms, half a mile W.S.W. of Baromee point.

TIDES.—It is high water, full and change, in Nelson bay at 8h. 30m., springs rise 4 to 6 feet. The tidal streams run about 6 hours each way, at the rate of from one to 2 knots southward of Yacaaba head; 2 knots within Entrance shoal; and 3 knots abreast Nelson bay.

DIRECTIONS.—Approaching port Stephens from the southward, give the islet which lies close off the east extreme of Stephens point, a berth of nearly half a mile in passing, to avoid the rocky ground which extends a cable's length from the island; and then steer about N.W. by N. towards the inner fall of Yacaaba. When Nelson head (a round wooded hillock, forming the western limit of the shoal bay within the entrance), opens of Toomeree head, steer N.W. by W., on which course the depth will gradually decrease from 11 to 6 fathoms, and then increase to 7 fathoms. Avoid shutting in mount Stephens with Toomeree head, to clear the eastern edge of Entrance shoal, until the north point of Little island is touching Yacaaba head, bearing E. by N., which leads northward of Entrance shoal in not less than $5\frac{1}{2}$ fathoms; and when mount Stephens is seen over the low neck between Toomeree head and Station peak, bearing S.S.E. $\frac{1}{2}$ E., the vessel will be westward of Entrance shoal in 6 fathoms, and may steer to pass within half a cable of Nelson head, which, with the edge of Middle ground on the west side of the channel, are steep-to. Round hill in line with Fly point S.W. $\frac{3}{4}$ S., leads one cable eastward of the tail of Middle ground. When abreast Nelson head steer for the western rocky point of Nelson bay upon which there is a whitewashed mark near the water's edge, avoiding the ledge which projects half a cable from Fly point.

Heavy tide rips and overfalls extend right across the entrance southward of Yacaaba head, on the ebb, after strong easterly or south-easterly weather. At such a time, or in heavy weather, vessels should enter only on the flood.

By Night.—Running for the port by night, after passing one mile east of Stephens point light steer N.W. $\frac{1}{4}$ N. for the entrance, and when Nelson head *white* light is seen clear of Toomeree head W. $\frac{3}{4}$ S., and Stephens point light bears S. by E., alter course to N.W. by W., making due allowance for the flood or ebb stream. Keep Stephens point light in sight open of Toomeree head until Nelson head light—which will be eclipsed while passing Entrance shoal—shows *red*, which in sight clears northward and westward of the shoal. After passing Nelson head the light changes from *red* to *white*, and may be used as a guide for anchoring in Nelson bay or proceeding farther up the port.

Stephens point light in line with Toomeree head, bearing S.S.E. $\frac{1}{4}$ E., leads over the tongue of Entrance shoal in $3\frac{1}{2}$ fathoms.

South Channel.—Proceeding for the inner portion of the port by South channel when abreast the white-washed rock on west point of Nelson bay, bring the northern end of the sandy beach, in Nelson bay, in line with and about half way down the south slope of Toomeree summit, bearing E. $\frac{3}{4}$ N. nearly, which will lead northward of the rocky knoll off Red-patch point and carry a vessel in 21 to 27 feet across the bank stretching to the northward from Sandy point and Corlette head; when the head bears S.S.E. steer for South narrows. Mount Ereepah, a conspicuous hill on the north side, in line with the south end of Boandabah island, bearing W.N.W., leads $1\frac{1}{2}$ cables westward of West bank; or, keep Bush islet shut in with Soldier point.

Soldier point, as well as Boandabah island, is bold to approach within a vessel's length of the rocks; and to avoid Soldier spit, which extends 3 cables to the eastward from Soldier point, fronting the shore and has as little as 5 feet on it, keep Bush islet open of the point.

The stream runs through on both sides of Boandabah island with considerable strength; the passage through North narrows is good, but being generally to leeward, is not to be preferred. After passing the Narrows and Fly rock, haul over to Fame point, and then towards Baromee point, to avoid the shoal on the port hand, which is connected with the rocky ledge. Having passed the ledge, which always shows, proceed up the harbour, anchoring in 4 or 5 fathoms, abreast of the next point above Baromee, with Tahlee house over the centre, or in line with the south point of Goat islet. The mark for avoiding the shoal ground to the southward is, to keep the highest part of Round hill, on the southern side of the port, open of Soldier point. Immediately beyond this anchorage the water shoals to $2\frac{1}{2}$ and $1\frac{1}{2}$ fathoms.

Vessels of 9 feet draught, may anchor within Goat islet; but the best anchorage for such vessels to discharge cargoes at, is off Limekiln point, in Balbrook cove.

The foregoing directions are suitable only for a vessel entering with a fair wind. If the wind be westerly, the anchor should be dropped in Nelson bay : she may, however, if the wind be not strong, turn up South channel, by a careful attention to the soundings, and a look-out for the shoals to the northward, which extend in shoal patches, from abreast of the white-washed point to Corlette head. From Corlette head there is no difficulty in working up the port, by attending to the leading mark for clearing West bank.

Middle channel.—Proceeding by Middle channel, after passing Nelson head, steer round the south edge of the dry Shifting sand, the steep extremity of which will be easily distinguished; and when abreast of the whitewashed mark on the west point of Nelson bay bring Station peak over the north end of Fly point, and when Round hill is in line with Red patch point the peak may be brought a little open northward of the end of the beach in Nelson bay, which will lead through the channel and northward of West bank.

Leaving by South channel, with a fair wind, steer from the anchorage off Baromee point for the south channel of the Narrows, and having passed them, keeping Bush islet open of Soldier point, steer for Corlette head until on the leading mark for South channel, the north end of Nelson bay beach in line with the southern slope of Toomeree head E. $\frac{3}{4}$ N. When abreast of Red patch point, bring the extreme of Nelson head on with the southern point of Yacaabee head to clear the shifting sand; and from Nelson head steer towards the inner fall of Yacaaba, until Little island is nearly in line with Yacaaba head; then steer out, and as soon as Stephens point opens to the eastward of Toomeree head, the vessel will have passed Entrance shoal.*

Working through the Narrows.—If the wind be contrary, a vessel may work down with the ebb stream, through the Narrows to the anchorage off Corlette head, in Salamander bay; in which space all the dangers are visible, or so marked upon the Admiralty plan, that no difficulty will ensue. The rocky ledge and the islets between it and Soldier point are rather bold-to, and may be approached to a cable's length; as the set of the tide stream is more regular there, it will be well to pass rather near to them, in order to avoid Fly rock, (which bears W. $\frac{3}{4}$ S. about 2 cables' lengths from the north point of Boandabah island, and N.W. by W. from its south point,) as well as to tack close to Soldier point, and enable the vessel to shoot through; but if this cannot be effected, there

* One of the chief dangers attending a sailing vessel going out of port Stephens with a scant wind, arises from the unsteady winds produced—when blowing from the southward—by the heights of Toomeree. A vessel should therefore round Entrance spit as close as possible, to avoid being set by the heavy swell against Yacaaba head. H.M.S. *Fly* was nearly lost, when going out of port Stephens, under these circumstances.

is plenty of room to tack in the Narrows, with 3 fathoms water at 2 boats' lengths off the point. Some long boards may then be made, taking care not to shut in Tahlee house with Soldier point until abreast of the third sandy beach in Salamander bay beyond that point. When abreast of Wanda Wanda head, avoid West bank, by not standing across so far to the northward as to bring the summit of mount Ereepah over the south end of Boandabah island, or Toomeree to the northward of Fly point.

Working through South Channel.—The turning marks between Sandy and Red patch points, are Station peak slightly open of the whitewashed point, and Toomeree summit over the north end of Fly point. Upon approaching Red patch point, bring the extremes of Nelson and Yacaaba heads in line to avoid Red patch rocks.

The vessel may stand towards the south-west extreme of the shifting sand until Station peak is nearly over Fly point. Working through the channel between the shifting sand and Nelson head the lead will be a sufficient guide. Standing towards the southern side of the channel, the helm should be put down in 5 fathoms; but on the northern side, the edge of Middle ground is steep-to, and continues so until Station peak opens to the eastward of Nelson head. Much caution, therefore, should be used in approaching this bank, for as the dry sands on it have been frequently observed to shift, this may also probably be the case throughout the whole extent, and more particularly at the north-east extremity. Between Nelson head and Entrance shoal the turning marks are, to keep the former between S.W. by S. and S.W. by W. $\frac{1}{2}$ W., and the flat summit of Corlette head open of Nelson head. When abreast Entrance shoal Little island should be kept in line with Yacaaba head until Stephens point opens of Toomeree head; remembering that the lighthouse in line with Toomeree head leads over $3\frac{1}{2}$ fathoms on the eastern part of the shoal.

Small vessels, and those well acquainted with the locality, when bound from port Stephens to the northward, can pass between Cabbage-tree island and Yacaaba head, passing the latter about 2 cables distant, and, keeping close along inshore to avoid the current, will find a deep water channel between the mainland and Broughton islands.

Winds.—In the winter months the strong westerly winds, which prevail at that season, may impede a vessel entering port Stephens; but in the summer, the wind is generally off the land until 10 a.m., and then the sea breeze sets in from south-east, gradually veering by east towards the north-east as the day advances. When the wind blows hard from the southward, some difficulty may be experienced between Nelson head and Nelson bay, on account of the narrowness of the channel and the tide-eddies; the latter are, however, sufficiently strong to carry a vessel clear of danger.

CHAPTER II.

PORT STEPHENS TO SANDY CAPE.

VARIATION IN 1879 :					
Port Macquarie	-	-	9° 55' E.	Moreton bay	- - 9° 25' E.
Clarence river	-	-	9° 45' E.	Sandy cape	- - 9° 5' E.

The COAST,* from port Stephens to Tacking point, between latitude 32° 45' S. and 31° 29' S., is generally low with many prominent headlands, and sandy beaches between. The shores southward of cape Hawke are studded with numerous sand-hills; northward of the cape the land, within the heads, is covered with thick timber scrub.

The 30-fathoms line of soundings, within which are all the dangers, extends from one to 7 miles from the coast; while the 100-fathoms line maintains an average distance of about 18 miles.

BROUGHTON ISLANDS.—A cluster of islets and rocks, the outer one of which, 300 feet above the sea, is the highest, lies N.N.E. $\frac{1}{4}$ E. 10 miles from port Stephens lighthouse. The shores of this outer island which is about half a mile long, are steep and rocky, 20 fathoms being found half a mile east of it; it is joined at low water by a chain of rocks to the larger and inner Broughton island, which is nearly $1\frac{1}{2}$ miles in length W.N.W. and E.S.E. and from one quarter to three-quarters of a mile wide. The shores of the larger island are low and rocky, with numerous rocks, shoals, foul ground, and irregular soundings extending some distance both north and south. About the centre of the island on its south side a projecting tongue of land forming two small bights on either side of it, runs for half a mile in a S. by E. direction, terminating in two rugged rocky points, with numerous detached high and low water rocks fringing their shores. One of these points runs in a S.S.W. direction for 3 cables and drops into 9 fathoms; the other projects S.E. by S. for the same distance, and its low-water extreme is connected

* See Admiralty chart, Australia, east coast, sheet V., port Stephens to Tacking point, with plans and views, No. 1,024; scale $\pi = 0.5$ of an inch.

This chapter was revised and corrected in March 1878, by Staff Commander Bedwell, in charge of Admiralty Survey, Queensland.

to a steep sugarloaf-shaped islet about 100 feet high, named South rock, on the south side of which there are 19 and 15 fathoms.

The outer island is rocky almost to its summit, on which patches of green scrub are visible. The east end of the inner Broughton rises to a steep, rocky, conical peak 286 feet above the sea, with a perpendicular face to the east and south-east. The western half of the island is low, covered with a thick tangled scrub; the soil is good. A few Chinese visit this island during the fishing season and occupy two rudely-built huts, which are standing on the shores of the sandy beach on the north side.

Esmeralda cove running into the island to the eastward of South rock is 2 cables wide at its entrance and 3 cables deep, with 4 to 10 fathoms between its heads, decreasing to 3 fathoms, half a cable from the sandy beach at its north extreme. A dangerous rock with 5 fathoms, breaking in bad weather, lies one cable S.E. of and across the entrance. A large London ship (*Esmeralda*) finding herself close inshore in an easterly gale, unable to get off the land, with all her sails blown away, ran into this cove and up on to the beach at its head, where she was quite snug, and was safely towed off after the weather moderated, without any great damage to either ship or cargo.

On the west side of the peninsula is another small sandy bay, not so deep as Esmeralda cove, and shallow, with reefs and rocks about it; from its west end the coast trends N.N.W. for nearly three-quarters of a mile to a low rocky point, the north-west extreme of the inner Broughton island.

The shores of the islands are broken and irregular. Shoal patches of rocky ground, with from 8 to $2\frac{1}{2}$ fathoms on them, extend from half a mile to a mile in a south-west direction; they all break in heavy weather from the south-east, and altogether it is a dangerous locality.

North rock, 75 feet high, lies N.E. by E. nearly a mile from the north-west point of the inner Broughton island; its east side is steep and cliffy with 8 fathoms within a cable, and the same distance from its west side are some sunken rocks with 9 fathoms close to them. Between these rocks, and the point, about one quarter of a mile from the latter, is a high-water flat-topped rock, with from 4 to 6 fathoms between and the north-west point, and 7 and 8 fathoms from it to North rock.

One quarter of a mile S.W. from North rock is the north extreme of a ledge of sunken rocks, with from one to 3 fathoms on it, running out N. by W. from the centre of the north shore of Broughton island; this ledge breaks in places in moderate weather, and the bottom can always be distinctly seen when over it; on its east side are from $4\frac{1}{2}$ to 9 fathoms

and on its west from $3\frac{1}{2}$ to 8 fathoms. Between its northern edge in 2 fathoms and North rock are from $4\frac{1}{2}$ to $6\frac{1}{2}$ fathoms.

Inner rock, which is high and rocky, lies N.N.W. $\frac{1}{2}$ W. about 3 cables from the north-west point with 5 to 9 fathoms between. A small detached high-water rock lies off its south-east point; about 4 cables from Inner towards North rock is a sunken reef with from one to 2 fathoms on it, and 7 and 8 fathoms close-to on either side.

Nearly in the centre of the north shore of the inner island a curved sand beach will be observed, and on its east end a ledge of rocks, dry at low water, projects some distance to the northward; about one quarter of a mile N.N.W. $\frac{1}{2}$ W. from them is a single rock which dries, with $3\frac{1}{2}$ fathoms between it and the shore.

Between the west shore of the inner island and Dark point on the mainland (the only rocky bluff on the beach for miles) are two distinct patches of dry and sunken rocks which are nearly always breaking; the inner one, W. by S. $\frac{1}{4}$ S., distant one mile from the north-west point of Broughton island, dries in the centre, and is about a cable in extent, the soundings ranging from 2 to 5 fathoms at the distance of a cable; $3\frac{1}{2}$ cables to the eastward, and separated from it by a 9-fathoms channel, is the visible head of the outer reef, which dries for about the same extent, but S.S.E. $\frac{1}{4}$ E. $3\frac{1}{2}$ cables from its centre, a rocky tail projects with from $1\frac{1}{2}$ to 5 fathoms on it, breaking in bad weather. There are 6 and 8 fathoms close to the north edge of the outer reef, and between it and the island there is half a mile of deep water with from 7 to 11 fathoms.

Inner passage, between Dark point and the inner reef, is three-quarters of a mile wide, with from 8 to 11 fathoms. Coming from the southward bring Dark point on the sandy beach to bear North, and steer for it until port Stephens lighthouse is seen exactly midway between Cabbage-tree and Boondelbah islands, bearing about S. by W. $\frac{1}{4}$ W. Alter course to N. by E. $\frac{1}{4}$ E. and keep the mark on astern until North rock is brought on with the south extreme of Inner rock, bearing E. by N. $\frac{1}{4}$ N.; the vessel will then be in 10 fathoms, clear of the inner reef, and may haul up for Sugarloaf point.

From the northward pass within one quarter of a mile north-west of Inner rock and steer with Dark point a little on the starboard bow, until the leading mark, the lighthouse exactly between the two islands is brought on; steer with these marks in line, and when North rock is touching the low north-west point of Broughton island the vessel will be half a mile south of the reef, and may haul out as requisite. This channel should only be used by persons acquainted with the locality.

Anchorage.—Small sailing and steam-vessels having the chart or local knowledge of the Broughton islands with their off-lying dangers

may find anchorage among them with almost any wind ; strangers are, however, warned to be cautious when approaching these islands for shelter. With southerly winds the best shelter will be found on the north side of the inner island, about midway between the west end of the sandy beach and the flat high-water rock already mentioned, with the north-west point bearing West, one quarter of a mile distant in $4\frac{1}{2}$ to 6 fathoms, sandy bottom.

Steam-vessels making this anchorage from the northward, unable to reach port Stephens, should pass one quarter of a mile to westward of North rock, between it and the sunken reef, which will be seen breaking, steering up with Flat rock on the starboard bow, passing it within half a cable in 6 fathoms, and anchor on that line when the north-west point bears West. The vessel will then be $1\frac{1}{2}$ cables off shore and the same distance from Flat rock, with the northern point of the outer Broughton island in sight, bearing E. by S. $\frac{1}{4}$ S.

Steam-vessels might anchor even closer in with the northern points of the islands in line. Sailing vessels from the northward, with a southerly wind, when beating up towards the islands would find the water getting much smoother as they approach, so that enough sail could be carried, even with a strong wind, to beat up to the anchorage already described ; the clearest passage in for them would be by passing north of Inner rock on the port tack and standing inshore until the north-west point can be fetched ; rounding this point as close as convenient, 4 fathoms being found alongside the rocks, anchor in the position already described. On a sudden shift of wind to the east or north-east a vessel would have only to hoist her jib, and run round the north-west point of the island to the anchorage westward of it, or make sail to the southward with a fair wind, remembering that North rock, seen over a low neck of land on the north-west point of the island, bearing N.E. $\frac{1}{2}$ E., leads south of the tail of the outer rocky patch between the islands and the main, already described.

With north-east or easterly winds good anchorage will be found to the westward of the island, between it and the outer reef, in from 6 to 11 fathoms, with the north-west point N. by E. $\frac{1}{2}$ E. 3 cables, and South rock in line with the point of the island this side of it bearing about S.E. On a shift to the southward either get under weigh and passing inside or west of Inner rock, make a fair wind if bound north, or run round the north-west end of the island into the northern anchorage.

Nearly $1\frac{1}{2}$ miles S.W. by W. $\frac{1}{4}$ W. from South rock, is a patch of 2 fathoms which breaks. Broughton island peak open a little eastward of South rock summit (view D, Chart No. 1,024), leads nearly one mile east of the breaker.

SUGARLOAF POINT, commonly known as Seal Rock point, (view C, chart No. 1,024,) is a projection of the mainland 224 feet high,

with a white pile on its summit, bearing N.E. by N. 15 miles from the south-east extreme of Broughton islands. A reef extends S.E. by S. one third of a mile from Sugarloaf point and terminates at Peaked rock, which, together with the point, may be passed in 10 fathoms, at the distance of one quarter of a mile.*

LIGHTS.—From a lighthouse on Sugarloaf point a white light *revolving* every *thirty seconds* is exhibited at an elevation of 258 feet above the sea, visible from a distance of 22 miles. In addition to and below the revolving light, a *fixed green* light is shown from the same tower, visible between the bearings of North and N.W. by W. $\frac{1}{2}$ W. for a distance of about 3 miles, including in this arc Seal rocks and adjacent dangers, but not Edith breaker, which is out of the fairway, and from which the *green* light cannot be seen.

Vessels standing towards, or rounding, Sugarloaf point must keep out of the range of the *green* light.

Treachery head, S.W. $\frac{1}{2}$ S. $1\frac{1}{2}$ miles from Sugarloaf point, has a small rock close off it. A rock with $3\frac{1}{2}$ fathoms on it, lies S.S.W. one third of a mile from the head.

Edith breaker is a rocky shoal from which the white pile or Sugarloaf bears nearly N.N.E. $\frac{1}{2}$ E. 3 miles, and the large Seal rock N.E. by E. $2\frac{1}{2}$ miles. This shoal has 25 feet water on it, and 18 to 20 fathoms immediately round it, and with any swell causes a dangerous breaker, lying as it does directly in the track of coasters within Seal rocks.

Edith breaker may be cleared on the west side, by keeping Treachery head in line with a remarkable white sand-patch, at about one-third of a mile to the westward of Sugarloaf point.

Seal rocks.—The northern and larger rock, which is 15 feet high and has a sunken rock, close to the south-eastward of it, lies nearly S.E. $\frac{1}{2}$ S. $1\frac{1}{2}$ miles from Sugarloaf point. The southern and smaller Seal rock lies S. by W. $\frac{1}{4}$ W. two thirds of a mile from the larger rock, and has a sunken rock on which the sea breaks, at one quarter of a mile to the southward of it.

There is a channel nearly one mile wide, with 8 to 16 fathoms water, between Seal rocks and Sugarloaf point.

Sugarloaf bay on the north side of Sugarloaf point, is nearly half a mile wide, affording anchorage for small vessels sheltered from south-west or southerly winds. The best anchorage is in 4 fathoms, with the white-topped rock forming the east point of the bay, bearing E.N.E.

* See plan of Sugarloaf anchorage, on Admiralty chart, No. 1,024; scale $m = 2\cdot0$ inches.

Black or Skeleton rocks, North $1\frac{1}{2}$ miles from the anchorage in Sugarloaf bay, and nearly one mile from the shore, lie North and South about a cable apart, with 13 fathoms between, and 11 to 16 fathoms close around them.

Charlotte head, N. $\frac{1}{2}$ W. $6\frac{1}{2}$ miles from Sugarloaf point, is a bold headland, 349 feet high; its outer part, which is bare of trees but grassy, may be passed in 8 to 10 fathoms, at the distance of one quarter of a mile.

The southern portion of the intermediate coast is generally low and woody, and at 3 miles northward of Sugarloaf point Smith lake approaches within a cable's length of the sea-shore. At nearly 2 miles southward of Charlotte head, South Woody peak rises from the shore to the height of 652 feet, and has a remarkable bare green patch on the north-east part of its base, at three-quarters of a mile to the north-eastward of which is Boomerang point, with two small rocks off it.

From Sugarloaf point to Charlotte head there are generally 3 to 5 fathoms, sand, at one quarter of a mile from the shore, with no other detached dangers than Skeleton rocks.

Anchorage.—Between Charlotte head and North Woody peak, a hill 625 feet high, at $1\frac{1}{4}$ miles to the north-westward of the head, is a small bay, affording an anchorage for coasters, in 4 fathoms, well sheltered from southerly winds, and with a good supply of fresh water near it.

Cape Hawke, $7\frac{1}{4}$ miles northward of Charlotte head, is densely wooded to its summit, which is 777 feet high. The cape, which at a distance, appears as two hillocks, has some rocks close northward and southward of it, which may be passed in 7 to 10 fathoms, at the distance of one quarter of a mile.

The coast between North Woody peak and cape Hawke is a narrow strip of land, with 8 to 10 fathoms, at half a mile from the shore, and forms a natural embankment between the sea and Wallis lake, which extends from behind Charlotte head to 4 miles north-westward of the cape, where it communicates with the sea by a narrow channel, with only $1\frac{1}{2}$ feet water on the bar which crosses its entrance.

Anchorage.—The best is off the entrance to Wallis lake, in 8 fathoms, about three-quarters of a mile north-eastward of the bar.

Halliday point.—From the entrance of Wallis lake the low, wooded coast trends nearly N. $\frac{3}{4}$ E. $6\frac{1}{4}$ miles to Halliday point. There is a rock close off it; and a reef, with a rock dry at half tide, extends about half a mile south-eastward from the point. At a mile farther to the northward are two other points, from which a rocky ledge extends nearly half a mile eastward.

Wallabi point, N. $\frac{3}{4}$ E. $3\frac{3}{4}$ miles from Halliday point, is a rocky

projection with a pool of water close to the southward; the intermediate shore is low and clothed with scrub.

Schnapper rock, with 21 feet water on it and 11 and 12 fathoms close around it, lies N.E. $\frac{3}{4}$ N. $3\frac{3}{4}$ miles from Halliday point.

From a rocky projection, with a shoal spit, three-quarters of a mile northward of Wallabi point, a low unbroken woody coast extends N.N.E. $\frac{3}{4}$ E. 9 miles to Harrington inlet. At $2\frac{1}{2}$ miles to the northward of Wallabi point are sunken patches, stretching half a mile from the shore with breakers on them, from whence the old bar of Farquhar inlet extends $1\frac{1}{2}$ miles to the northward. Farquhar inlet, which until 1844 was open to the sea, is now closed.

From cape Hawke to Harrington inlet the coast may be generally approached, to half a mile, in 3 to 5 fathoms, with no other detached danger than Schnapper rock and a $4\frac{1}{2}$ fathoms patch, lying nearly N.E. by E. $\frac{1}{4}$ E. $1\frac{1}{2}$ miles from Wallabi point.

HARRINGTON INLET and MANNING RIVER.—

Harrington inlet, which forms the estuary of Manning river, is a bar-harbour, only accessible to coasting vessels, and from the shifting nature of the bar, should not be attempted without a pilot. The inlet may be easily recognised by the pilot station, known as the Painted rock, on the north side of the entrance, being a rocky mound, cleared from the surrounding trees, and having a signal-house and flagstaff.

The shore being low, with an unbroken line of beach, extending several miles on either side of Harrington inlet, Crowdy head, a prominent bluff, 185 feet high, projecting from the low coast $3\frac{1}{2}$ miles to the north-eastward, is also a good mark for showing the position of the inlet.

Pilot signals.—The pilot signals in Harrington inlet are the same as those used in the ports to the southward (*see* page 26).

Supplies.—The supply of provisions is uncertain; but wood for fuel may be procured.

There is a shipbuilding yard, at which a disabled vessel may probably get repaired in case of necessity.

LIGHT.—A *fixed* white light, 100 feet above the sea, visible 6 miles, is shown from a small square building 12 feet high, painted black, on the hill at the pilot station.

TIDES.—It is high water, full and change, in Manning river, at 9h. 15m.; springs rise 5 feet, neaps 3 feet; but with southerly winds and a heavy sea, the stream will run in an hour or more after high water, though the tide be falling.

DIRECTIONS.—Harrington inlet being somewhat embayed, it is advisable in an easterly wind, to keep an offing at night, or when the tide does not serve for crossing the bar. Having made out the entrance of

Harrington inlet by the land-marks already noticed, a stranger should not approach nearer than half or two-thirds of a mile, to make the usual signal for a pilot, which will be answered at the station.

The bar of Harrington inlet, on which the depth, at low-water springs, varies from 4 to 7 feet, extends across and about half a mile from the entrance. From the bar upwards, for a distance of 2 miles, are numerous flats and sand-banks, intersected by small blind channels.

The mark for carrying the deepest water across the bar, and for other reasons showing the safest passage, at the present time, is a pole with a flag on it at the top of the pilot station or Flagstaff hill, in one with a similar pole two-thirds down the side of the same hill, both of which are painted white. The lower flag pole is shifted either to one side or the other, as the shifting nature of the bar requires. It must, however, be understood that the bar is a very dangerous one, and may so shift as to render it impossible to show leading marks for crossing; in such a case the signals must receive special attention.*

The anchorage is inside South head; but there is no watering place nearer than 2 miles from the bar.

Crowdy head is a prominent head-land 185 feet high, jutting out from the low wooded land north-eastward of Harrington inlet. Some sunken rocks lie three-quarters of a mile south-westward, and a $3\frac{1}{2}$ -fathoms patch, on which the sea breaks, lies half a mile eastward of the head, between which and the patch is a 6-fathoms channel, about one quarter of a mile wide.

Forde rock, which dries at low water, lies near the north-east edge of a shoal spit extending about one quarter of a mile northward from Crowdy head.

Crowdy bay† is a small bight on the north-west side of Crowdy head, affording anchorage for coasting vessels, in 4 fathoms, sheltered from south-west and westerly winds.

Curphy shoal, which breaks with a south-east swell, lies N.N.E. $\frac{1}{4}$ E., 3 miles from Crowdy head, and has 5 fathoms on its shoalest part, with 13 fathoms inside.

Three Brothers are three remarkable densely-wooded hills contiguous to each other, extending from one to 5 miles inland from between Indian head and the southern entrance point of Camden haven, and forming the eastern extremity of a high range stretching out from the interior; the northernmost hill, 1,700 feet high, which rises N. $\frac{1}{2}$ E. 35 miles from cape Hawke, is the broadest, and nearest to the sea; being visible at

* Further detailed directions are published in "The Australian Coasters Guide," Sydney.

† See plan of Crowdy bay, on Admiralty chart, No. 1.024; scale $m = 2\cdot0$ inches.

about 50 miles from a vessel's deck, it is an excellent mark when making or passing along the coast.

Indian or Diamond head, $7\frac{1}{2}$ miles N. by E. from Crowdy head, rises to a bare summit 341 feet high with a cliffy face to the eastward; some rocks lie close off and to the northward of the head.

Mermaid reef, $4\frac{1}{2}$ miles south-eastward of Indian head, may be said to have three distinct knolls, Middle, or main knoll, which dries at low water; Outer, bearing East nearly one quarter of a mile from Middle knoll, with 3 feet on it at low water; and Inner, N.W. by W. a little more than one quarter of a mile from Middle knoll, with 5 feet on it at low water. Between Middle and Outer knolls there is a clear channel, with 4 to 5 fathoms; but from Middle to Inner knoll the water is discoloured and irregular in depth. Middle knoll always breaks; the Outer occasionally; and Inner knoll, being somewhat sheltered by the others, seldom breaks.

From Middle knoll South Brother hill bears W. $\frac{1}{4}$ N., the nearest part of the beach, in the same direction, being distant 2 miles, and the top of Indian or Diamond head N. by W. $\frac{1}{4}$ W.

The marks for clearing Mermaid reef are to the eastward, highest part of Indian head and summit of North Brother in line, bearing N.N.W. $\frac{1}{2}$ W. (view A., chart No. 1,024). To the westward, extreme point of Indian head in line with the high perpendicular bluff of Camden head bearing N. by E. (view B., chart No. 1,024).

Camden head, 400 feet high and bare of trees, is 5 miles N. by E. from Indian head, and is the southern point of the entrance to Camden haven. The head terminates in Perpendicular point 175 feet high, $1\frac{1}{2}$ cables off which there is a rock which dries at low water.

Camden haven, is the estuary of Johns river, which, flowing eastward and northward round the foot of North Brother hill, forms between it and the shore a narrow neck of land half a mile across. A shallow bar of not more than 3 feet water stretches across the entrance of the haven, and is seldom available even for small vessels.

Tacking point.^{*}—From Camden haven the low sandy shore trends N. by E. $\frac{1}{4}$ E. about 11 miles to Tacking point. Two and a half miles from the haven is Grants head a bluff point 385 feet high; and 3 miles farther north is the closed mouth of lake Innes which breaks out during freshets. Tacking point is the south-eastern extremity of the comparatively high land extending northward to port Macquarie; the summit of the point is composed of small irregular hummocks, the northernmost being a rocky lump of sugarloaf form. Thence a steep and more elevated shore, skirted by rocks for 3 cables off, extends N.N.W. to port Macquarie.

^{*} A fixed white light is exhibited from Tacking point, visible about 10 miles.

The COAST, from Tacking point to Coffs islands, between latitude $31^{\circ} 29' S.$ and $30^{\circ} 18' S.$,* a distance of 70 miles, is mostly low and sandy, covered with thick scrub, and broken at intervals by rocky points, which when first seen from seaward appear like islands; behind this low coast the land quickly rises to hills of moderate height, well covered with wood, and showing as sharp and irregular peaks. Upon the sandy beaches the surf generally breaks heavily.

The known dangers on this portion of the coast are all within the 20-fathoms line, which is from one to 4 miles from the shore; the water thence deepens regularly eastward to the 100-fathoms line running nearly North and South, at from 9 to 15 miles from the heads.

PORT MACQUARIE is the embouchure of Hastings river; its entrance lying N.N.W. about 3 miles from Tacking point. It is a bar harbour, and is very dangerous of access, by reason of the banks of sand that project from Pelican point, the low north sandy point of entrance, and on which the sea breaks and forms sand-rollers; they, however, serve to show the edge of the channel, which is about 90 yards wide. From Green mound (a remarkable conical-shaped hillock), the south shore trends nearly West to the narrow entrance opposite Pelican point.

The bar.—From between Green mound and the next projection to the westward, the bar stretches across towards the sand-rollers, and is about 120 yards in extent. The depth of water on the bar varies from 5 to 10 feet; but when there is only one channel, and that straight in and out, there is seldom less than 7 feet, at low-water springs. At times, however, there are flats within the bar, but this is only the case when a long interval elapses, during which time there have been no freshets in the river.

Anchorage.—There is good anchorage and smooth water, with off-shore or southerly winds, in 6 fathoms, hard sand, with the flagstaff bearing S.W. by W., and Bird rock S.S.E.

Town.—The town of port Macquarie, on the southern side of the port abreast Pelican point, is the shipping place for the produce of the neighbouring agricultural districts; large quantities of grain, tobacco, and wine being annually exported. In consequence of the uncertainty of the climate, the cultivation of sugar has, after persevering efforts, been almost abandoned. The population of the town is nearly 700. Monthly communication is maintained with Sydney, by steam, in addition to numerous sailing vessels.

* See Admiralty chart, Australia, east coast, sheet VI., Tacking point to Coffs islands, with plan and view, No. 1,025; scale $n = 0.5$ of an inch.

Supplies.—Vessels requiring provisions or water, can be easily supplied, in moderate weather—when the pilot can get out from the boat harbour—without entering the port, either at anchor outside, or when standing off and on; no charge being made in such cases for services rendered.

Pilots.—There is a pilot to take vessels in and out over the bar; and vessels not requiring a pilot, will have the tidal, or other necessary signals made to them.

TIDES.—It is high water, full and change, on port Macquarie bar, at 9h. 15m.; springs rise 5 feet, neaps 3 feet; but the tides are often considerably affected by the sea and wind, causing them to flow sooner and longer than they otherwise would.

DIRECTIONS.—The principal obstacles to the safe navigation of port Macquarie, are two sunken rocks in the channel, on the south side, the outer having 5 feet, and the inner 4 feet on it at high-water springs. Two chequered obelisks on the south shore, in line, and the Gut beacon in line with a dead tree, having a horizontal cross beam on it, on the western shore, mark the position of the Outer rock, from which the Inner rock bears S.W. about 15 yards.

A white obelisk on the western shore of the port, southward of the cross, in line with the round-topped beacon near the asylum, leads over the bar in the deepest water; the removal of the obelisk will indicate that the fairway has again shifted, and that the old marks—the cross and beacon—can again be used.

Vessels arriving from the southward with a fair wind, and requiring a pilot, should hoist the usual signal on first sighting the flagstaff, and heave to or stand off and on to windward of the port, when, if possible, the pilot will come off, but if not, the signal will be made (*see* page 26) whether to stand in or off the bar, according to circumstances. With a westerly, or south-west wind and smooth water, a vessel may stand on and work up towards the bar; but vessels coming from the northward, with a fresh north-east breeze, should—unless signalled to stand in—haul their wind at least 2 miles to windward of the bar, whether to take a pilot or wait for the tide, as the current generally sets strong to the S.S.E.: when the pilot cannot come off, but hoists the signal to steer for the boat inside the bar, care should be taken to steer whichever way the boat flag is waved, steering only direct for the boat when the flag is held stationary.

The COAST.—From port Macquarie a sandy beach trends about 7 miles in a N. $\frac{1}{4}$ E. direction to Plomer point, which is fringed by rocks extending off about one quarter of a mile. From here the coast extends in the same direction, but in a series of slight sandy bays with rocky

points, for $16\frac{1}{2}$ miles to Korogoro point, which rises to a conical peak 502 feet high. About 3 miles northward of Plomer point, and half a mile from the shore, is Green islet, with rocks between it and the coast. From Korogoro point the beach curves inwards and northwards to Smoky cape which lies North 7 miles from the point. Smoky cape has three hummocks, on as many projecting parts, the southern and highest being 1,035 feet high. Fish rock, 40 feet high, lies S.E. one mile; and Black rocks, 25 feet high, S. by W. $1\frac{1}{2}$ miles from the southern bluff; Green islet and other rocks lie close off the cape to the northward.

Trial Bay, immediately westward of Lagers point, the northern extreme of Smoky cape, affords good anchorage and shelter from the sea, in southerly winds round to E.S.E. Approaching from the southward in strong southerly winds, pass about 2 cables eastward of Fish rock, and keeping the same distance from Smoky cape until abreast Lagers point, haul into the bay, and anchor in 6 fathoms, with Lagers point bearing E.N.E. Two streams of water run into either end of the bay, and wood may be obtained on the eastern side.*

MAC LEAY RIVER—which is only capable of admitting small coasting vessels—communicates with the sea by a narrow channel between the north extreme of the narrow tongue of land, extending from Trial bay between the river and the sea, and North, or Double head of the river, on which is the signal staff and pilot station, bearing N.W. $6\frac{1}{4}$ miles from Smoky cape.

The Bar across the entrance of Mac Leay river has during the year, from 7 to 15 feet water on it. Two beacons in line lead over the outer bar in the best water. The fairway is winding, so that the leading marks do not serve for its whole length. There is a channel within the bar running parallel with the channel of the river, having 3 to 4 fathoms water, where vessels can anchor in safety. The channels of the river are very shallow and intricate, there being only 5 to 6 feet at high-water springs; and the inner channel is obstructed by large trees lying on the bottom.

TIDES.—It is high water, full and change, in Mac Leay river, at 9h. 15m.; springs rise 5 feet, neaps 3 feet.

DIRECTIONS.—No reliable directions can be given for Mac Leay river in consequence of the shifting nature of the bar and the inner channels. A vessel approaching the river from the offing, with strong southerly or westerly winds towards night, should anchor in Trial bay until the morning. Then weigh and proceed along the land until off North head, where heave to and ascertain by the signals on the flagstaff, the state of the tide and whether there is sufficient water on the bar. If requiring a

* See plan of Trial bay, on Admiralty chart, No. 1,025; scale, $m = 2.0$ inches.

pilot, no stranger should attempt to enter without one, the usual signal should be made, which will be answered from the staff whether it is practicable to send a boat, or that the vessel should stand in, or off from the bar (*see* signals, p. 26).

Vessels taking the bar with strong south-east or easterly winds, and a heavy break on, should take in their light after sails and let them hang loose, ready for setting in case of need; and crossing with the beacons in line, keep the vessel before the wind until in smooth water; the anchors should have good buoy ropes and buoys.

Outward bound vessels should only leave at still water.

The COAST.—From North head of Mac Leay river the coast trends nearly N. $\frac{1}{2}$ E. 30 miles to Coffs islands. The coast is low and consists of sandy beaches and rocky points, and should not be approached nearer than one mile; it is intersected by two small rivers and several creeks.

Nambuckra, the southern river, flows into the sea on the south side of a low rocky point, at 16 miles northward of Smoky cape. There is a large rock awash in the entrance channel within the bar, from whence up to the anchorage the bottom consists of a bed of rocks. This river is frequented by small vessels for cedar, the only export.

Bellinger River to the northward of Nambuckra river, and N. by W. $\frac{1}{2}$ W. 25 miles from Smoky cape, has no headland, and the entrance is difficult to find, as it is always shifting and is shallow; it is only frequented by small vessels for timber.

TIDES.—The time of high water in Nambuckra and Bellinger rivers is nearly the same as in Mac Leay river.

Coffs Islands, lie N. $\frac{1}{2}$ W. 37 miles from Smoky cape, and extend about one mile from the shore. North and South Coffs are each about 600 yards long; a small islet lies E.S.E. half a mile from South Coffs with a rock midway between it and the island. South Coffs is in latitude $30^{\circ} 18' 20''$ S., longitude $153^{\circ} 9' 48''$ E.

There is anchorage for coasters, in southerly and westerly winds, under the north side of North Coffs island in about 6 fathoms. Some rocks, always uncovered, lie westward of the anchorage, and a rock, upon which the sea breaks, about half a mile northward of the island.

The COAST,* from Coffs islands to Evans head, between latitude $30^{\circ} 18' 20''$ S. and $29^{\circ} 8' 30''$ S., although continuing of the same low character as that to the southward, is less regular in its outline, and the coast range of rocky hills approaches nearer to the shore; many streams of fresh water also run into the sea. The off-lying islands and rocks, on the southern

* See Admiralty chart, Australia, east coast, sheet VII., Coffs islands to Evans head, with views, No. 1,027; scale, $m = 0.5$ of an inch.

part, extend 6 miles from the shore, and, together with all the hidden dangers, are within the 30-fathoms line of soundings.

SOLITARY ISLANDS* are detached clusters of islets and rocks scattered over a space of about 22 miles along the coast and 4 to 6 miles from the shore. Split Solitary, the southernmost, N. by E. 4 miles from North Coffs island, is 130 feet high, and, as its name implies, is completely divided into two parts by a rent or cleft; irregular ground of from 5 to 9 fathoms extends from it to the shore, which is distant $1\frac{1}{2}$ miles. E. by N. $\frac{1}{2}$ N. nearly one mile distant is a shoal spot of 22 feet, and N.N.E. $\frac{1}{2}$ E. 3 miles, nearly midway between South Solitary and the shore, is a patch of 14 feet, both of which break. Bellinger peak in line with the eastern points of Coffs islands, leads close eastward of these patches.

South Solitary, about 500 yards in length, and 140 feet high, is N.E. by N. 9 miles from Coffs islands; two detached rocks lie off its east and north ends, and Black rock, 6 feet above high water, is half a mile W.N.W. A small rock which dries at low water lies 3 cables West from Black rock.

S.W. Solitary, 400 yards in extent, and 120 feet high, lies N.W. $\frac{1}{2}$ W., $3\frac{1}{2}$ miles from South Solitary and one mile from shore; a reef and foul ground extend 2 cables from the southern side.

N.W. Solitary, N. $\frac{3}{4}$ W., 11 miles from South Solitary, is 600 yards long and 30 feet high; two patches of 9 and 12 feet, which break, lie W.N.W. one mile, and N.N.W. half a mile from the rock; also a patch, awash at low water, E.N.E. $2\frac{1}{4}$ miles. Bellinger peak, in line with the inner extreme of S.W. Solitary, leads one cable eastward of this latter danger.

North rock, 20 feet high, is $2\frac{1}{2}$ miles northward of N.W. Solitary, and one mile from shore; nearly abreast is Red Bank river, and about $2\frac{1}{2}$ miles North is a bight formed by a projecting point, into which a stream flows; both are available for boats.

North Solitary, 140 feet high, and two thirds of a mile in length in a N.W. by N. and S.E. by S. direction, consists of two rocks with a narrow passage between; N.W. rock, 12 feet high, lies N.W. by N. two thirds of a mile from its northern point, and a small pinnacle of 15 feet water, which breaks, lies North half a mile.

Several smaller rocks lie near the mainland shore, which is foul and dangerous to the distance of one mile.

The Solitary islands may be boldly approached from seaward; but the passages between them and the mainland should not be used except during daylight by small vessels, with local knowledge.

* See Admiralty chart, Solitary islands and adjacent coast, with view, No. 1,026; scale, $m = 1.5$ inches.

LIGHT.—Pending the establishment of a permanent light, a temporary light will be exhibited from the flagstaff on South Solitary island.

Soundings.—30 fathoms water will be found about $1\frac{1}{2}$ miles to the eastward of the South, and also at one quarter of a mile from the south end of the North Solitary. Within the north and south limits of the islands the 30-fathoms line of soundings leads from 5 to 7 miles off the coast.

TIDES.—It is high water, full and change, at Solitary islands, at 9h. 15m.; springs rise 5 feet, neaps 3 feet.

Wooli Wooli River is about 2 miles North of the point of land which lies westward of North Solitary. Small vessels or boats may find shelter under its south head (from which a reef runs out to the extent of one quarter of a mile) during southerly or south-westerly winds.

Sandon Bluffs, 250 feet high, at the northern end of some sandhills, and covered with low shrubs, are N.N.W. 15 miles from North Solitary island, and from the eastward show as white cliffs.

Sandon Shoal, which breaks in heavy weather, lies S.E. $\frac{1}{2}$ S. 2 miles from Sandon bluffs; the least water being $4\frac{1}{2}$ fathoms. Mount Leone in line with Sandon bluffs N. by W., leads three-quarters of a mile westward; and mount Leone in line with Bare bluff N. by W. $\frac{3}{4}$ W., leads half a mile eastward of the shoal (views C and D, chart No. 1,027).

Sandon river is immediately north of Sandon bluffs; a small island lies across its mouth. Sandon river, and Wooli Wooli river 14 miles to the southward, are only available for boats.

Half a mile N.E. of Bare bluff, which is 4 miles North of Sandon bluffs, is Buchanan rock, which breaks in heavy weather. Saddle hill open south of Sandon bluffs, bearing S. by W., leads nearly one mile East of the rock (view B., chart No. 1,027).

Freeburn rock which breaks and has 9 feet over it, lies half a mile from the shore, and 5 miles South of the entrance to Clarence river.

Clarence Peak, a conspicuous conical hill, 1,200 feet high and 3 miles from the shore, is 21 miles N.N.W. $\frac{1}{4}$ W., from North Solitary island and is a valuable landmark for making Clarence river 10 miles to the northward (view E., chart No. 1,027). Double Duke hill, about 9 miles W. by N. of the entrance, is also a prominent object from seaward.

CLARENCE RIVER, of considerable and increasing importance, is the outlet for the produce of large and rich agricultural—the sugar cane being extensively cultivated—and pastoral districts, and affords the means of communicating from seaward with several rising and flourishing towns on its banks. The river is buoyed and beaconed, and navigable by vessels drawing 9 feet, to the city of Grafton situated on both banks of the river,

about 40 miles from the sea. Two lines of steamers ply between Grafton and Sydney, each about twice a week.

The entrance to Clarence river is not easily distinguished from the eastward and should be approached on its latitude.

South Head, the southern point of the entrance, in latitude $29^{\circ} 25' 30''$ S., longitude $153^{\circ} 22' 50''$ E., is 180 feet high; foul rocky ground extends to the northward nearly 3 cables, with a boat channel between it and the head. A red buoy lies northward of the inner edge of the foul ground. North head, 2 miles northward of the bar, is 150 feet high and bare. Wooded bluff, 180 feet high and thickly timbered, is the north-eastern point of the peninsula on the north side of the river; it shows a white cliffy face to the eastward and is conspicuous from the northward.

A Breakwater is in course of construction northward and eastward from South head.

The Bar.—The channel of the bar shifts and the depth of water varies, but 10 to 13 feet will generally be found. Two white beacons on North spit will, when in line, lead over the bar in the deepest water. The positions of the beacons will be altered to suit the changes of the channels. If possible, no vessel should cross the bar without a pilot, as the sea often breaks heavily, even in fine weather.

Pilots.—The pilots look-out is at the signal station on South head, where there is a flagstaff visible at the distance of 8 or 9 miles, and from which the usual coast signals will be made. See page 26. The coast storm signals are also made from the flagstaff.

LIGHT.—A *fixed* white light is shown from South head of Clarence river, visible from a distance of 7 miles.

TIDES.—It is high water, full and change, at South head, Clarence river, at 8h 30 m.; springs rise about 4 feet. The average strength of the tidal streams at the entrance of the river is from 3 to 5 knots an hour, after heavy rains it runs from 5 to 8 knots. For several days after freshets the ebb stream is of 9 hours duration, and there is no perceptible flood above Palmer reach.

DIRECTIONS.—Bound for Clarence river from the southward, after passing North Solitary island, Clarence peak and then the flagstaff on South head will be the guiding marks for the entrance.

Approaching the bar, keep Clarence peak open of Yamba or Outer South head until the white beacons on North spit are in line. Cross the bar with the beacons in line, as far as the red buoy; pass westward of the buoy and steer S.S.W., and anchor in from 3 to 7 fathoms. The navigation of the river above this point should not be attempted without local knowledge or the services of a pilot.

Entering the river from sea all red buoys should be left on the port hand and black buoys on the starboard hand.

Supplies.—Provisions, wood, water, and other necessities are plentiful in Clarence river; also appliances for heaving down, together with artificers and stores for the repairs of vessels.

Evans Head, N. $\frac{1}{2}$ E. $18\frac{1}{2}$ miles from South bluff of Clarence river, is a low sandy point; the low shore southward to Wooded bluff recedes into a deep bight in which are several shoal patches which break.

North Evans Reef, which always breaks, is a patch of foul ground half a mile in extent, lying S.S.E. 2 miles from Evans head. Richmond hill in line with Sand-bank, the southernmost of two conspicuous white patches on the shore, 5 miles northward of Evans head, bearing N.N.W. $\frac{1}{2}$ W. (view H., chart No. 1,028) leads one mile East of the reef.

South Evans Reef, breaks occasionally, and is 5 miles S. $\frac{3}{4}$ W. from Evans head; the least water on the reef is 2 fathoms. Clarence peak in line with Wooded bluff S. by W. (view A., chart No. 1,027) leads half a mile eastward.

The shore abreast South Evans reef is foul with rocks to the distance of half a mile.

There is a passage inside the reefs, used by coasting and steam vessels going to the northward, to avoid the southerly current outside. Strangers or vessels of large draught should not approach this part of the coast within 3 miles.

Evans creek, a small rivulet or arm of salt water, is in the bight of the low land, 2 miles north-westward of Evans head.

The COAST* from Evans head to Danger point, between latitude $29^{\circ} 8' S.$ and $28^{\circ} 9' S.$, includes the eastern point of the continent of Australia, and is the northern portion of the seaboard of the colony of New South Wales. Although much of the immediate shore is low and sandy, the land from the offing wears a bold and in some parts rugged aspect. Except off Danger point, the 10-fathoms line of soundings will be found within $1\frac{1}{2}$ miles of the shore, and all the dangers are within the line of 20 fathoms.

RICHMOND RIVER.—From Evans head a barren, sandy, and swampy coast covered with low scrub and a few Banksias and Pandanus palms, extends N. by E. 16 miles to Richmond river, which, for 12 miles southward from its mouth, forms between it and the shore, a low strip of land from one to 2 miles in width. Richmond river is a rapid stream about 120 miles in length, and navigable by small vessels for nearly

* See Admiralty chart, Australia, east coast, sheet VIII., Evans head to Danger point, with views, No. 1,028; scale, $m = 0.5$ of an inch.

60 miles from the sea. A considerable breadth of land on the banks of the river is occupied for pastoral and agricultural purposes, sugar being extensively cultivated. A large trade in cedar and other woods, is maintained with Sydney and Melbourne by numerous sailing vessels; there is also steam communication with Sydney.

Ballina, a small township at the mouth of the river, on the north bank, is the port of the district, and contains about 300 inhabitants.

The Bar.—The mouth of Richmond river is almost choked with extensive sand-banks, partially covering at high water, through which narrow channels, constantly changing in direction and depth, force their way to the sea. The bar, which should never be taken without the assistance of a pilot, is one of the most dangerous on the coast and nearly always breaks heavily; at present a depth of from 4 to 6 feet only will be found. When practicable, leading marks will be placed to show the best channel in.

Pilot.—The pilot station is on North head, from which vessels will be communicated with by signal (*see* page 26). When practicable, which is very rarely the case, the pilot will board vessels outside.

Tug.—A steam tug can generally be obtained from Ballina. The tug is also used for the pilot service.

LIGHTS.—Two *fixed* white lights are exhibited from North head of Richmond river, W.N.W. and E.S.E. from each other 150 feet apart, and are visible from a distance of 7 miles. The lights in line are a guide to the north channel of the river.

TIDES.—It is high water, full and change, on the bar of Richmond river, at 9h. 20m.; but strong south or south-east winds will make from $1\frac{1}{2}$ to 2 hours difference. If the moon can be seen, it will best show the state of the tide, as it is just young flood when the moon rises. The strength of the tidal streams at the entrance are from 4 to 5 knots, gradually decreasing to the head of tidal influence, which is upwards of 35 miles from the river's mouth, and where the time of high water is about 3 hours later than at the bar.

DIRECTIONS.—Strangers bound to Richmond river from the southward, with south or south-west winds, should not run down to within 5 or 6 miles of the bar until the flood makes, as there is generally a strong set to the northward in shore. When the bar may be taken, the ensign will be hoisted at the masthead of the flagstaff at the pilot station, and from a boat inside the breakers the pilot will direct the vessel through the deepest part of the channel by means of a flag, which will be waved in the direction the vessel should steer.

Lennox Head.—At 4 miles northward of Richmond river is

Lennox head, between which and cape Byron, North $10\frac{1}{2}$ miles from the head, is Broken head, with Cocked Hat rock above water close northward of it.

CAPE BYRON, the easternmost point of Australia, is a small but steep head, wooded, 330 feet high, and showing as white cliffs from the eastward (view E., chart No. 1,028), it projects about 2 miles from the low land, and is visible 25 miles; in proceeding along the coast from the northward or southward (view G., chart No. 1,028), it makes like an island. The position of the summit of the cape is in lat. $28^{\circ} 37' 40''$ S., long. $153^{\circ} 39' 20''$ E., and a depth of 30 fathoms will be found $2\frac{1}{2}$ miles off it.

Mount Warning rises N.W. by W. $\frac{3}{4}$ W. $24\frac{1}{2}$ miles from cape Byron, and from its comparatively great elevation—3,840 feet—is visible in fine weather fully 60 miles distant. The country at a few miles inland, from Richmond river to mount Warning, rises to hills of moderate elevation, is scantily covered with wood, but that surrounding mount Warning is hilly and well-wooded, and has altogether a more fertile appearance than is usually seen so near the sea on this part of the coast.

Cape Byron Bay, is immediately westward of cape Byron and affords good anchorage in 7 fathoms, with off-shore winds. A reef of rocks extends northward nearly half a mile from the point and apparently protects in some measure the anchorage for small vessels, from easterly gales; there is a continuation of the same reef for about a mile along shore to the westward, between the extremity of which and the bight of the bay, there is probably still more secure anchorage for small vessels, in about 3 fathoms; but it being necessary to approach within a very short distance of the shore, to get inside the end of the reef, it may not always be prudent to attempt it, when blowing hard from seaward, as there is often a heavy swell, even with southerly winds.

At $1\frac{1}{2}$ miles N.N.W. $\frac{1}{2}$ W. from the extreme of cape Byron are three rocks; the two highest, named Juan and Julia, are 54 feet above the sea. The 20-fathoms line is half a mile eastward of the rocks, and from 9 to 5 fathoms will be found westward to within one quarter of a mile of the beach.

Flat Top hill in line with a white sand-patch on the western shore of the bay (view E., chart No. 1,028), bearing W. by S., clears cape Byron reef and leads to the best anchorage in 7 fathoms, with Juan and Julia rock bearing N.E. by N., and cape Byron E. by S. $\frac{1}{4}$ S.

TIDES.—It is high water, full and change, in cape Byron bay, at 9h. 45m.; springs rise 6 feet.

DANGER POINT.—From cape Byron the sandy beach curves north-westward to Brunswick river, a small stream with sunken rocks

off its entrance, thence the general direction of the coast is North to points Hastings and Sutherland, off which reefs extend half a mile. Sutherland point is N. by W. $\frac{1}{4}$ W. $23\frac{1}{4}$ miles from cape Byron, and from it the shore bends back N.N.W. for 6 miles to Danger point, 200 feet high; a rocky spit projects half a mile westward from the north extreme of Danger point, with 2 fathoms between it and the point. Fingal point is $2\frac{1}{4}$ miles south-east of Danger point, and half a mile off it is Cook island, 110 feet high, with a ledge of 2 fathoms between it and the shore. Guy rock, above high water, is one cable off the north side of Cook island.

Anchorage.—There is anchorage, with off-shore winds, in 7 fathoms on the north-west side of Cook island, and in 8 fathoms half a mile north-westward of Danger point.

LIGHT.—From Fingal point is exhibited a *fixed* white light, visible from a distance of 7 miles.

The BOUNDARY LINE between Queensland and New South Wales commences at Danger point; after making a slight bend to the northward close along the coast it turns to the south-westward, passing over the summits of the Macpherson range of mountains, which attain a height of from 1,700 to 3,812 feet above the sea.

Tweed River, is immediately southward of Danger point; its entrance is half a mile wide, but is blocked by a sandy bar extending nearly across from the low southern point. The bar is exposed to the ocean swell and has not more than 3 feet at low water, it therefore cannot be recommended to any other than small coasting vessels, which must keep as close as safety will permit to the north side of the entrance. Inside, the river is two-thirds of a mile wide, but it is nearly filled up by a shoal, leaving a narrow channel on either side with 4 feet water.

Pilot.—A pilot will be found at the entrance of Tweed river, who will communicate by the usual coast signals.

TIDES.—It is high water, full and change, at Danger point, at 9h. 30m.; springs rise 6 feet, neaps $4\frac{1}{2}$ feet.

DANGER REEFS, are three detached rocky patches extending $2\frac{1}{4}$ miles eastward from Cook island. Outer reef, of $4\frac{1}{2}$ fathoms, lies E. by S. $\frac{1}{4}$ S. $4\frac{1}{4}$ miles from Danger point, N. by W. $26\frac{1}{2}$ miles from cape Byron, and E. by N. $2\frac{1}{4}$ miles from Cook island; South reef is $1\frac{1}{4}$ miles E.S.E. from Cook island, with 5 fathoms; and Inner reef, East, two-thirds of a mile from the island, with only 9 feet over its shoalest part. All the reefs break in bad weather, but there is deep water around them, and 20 fathoms will be found half a mile eastward of Outer reef.

There is a clear passage half a mile wide between Inner reef and the

rocks extending $1\frac{1}{2}$ cables from Cook island, which is used by steam vessels and small craft, in fine weather, during daylight.

Clearing Marks.—Danger point seen midway between Cook island and Guy rock, bearing N.W. $\frac{1}{2}$ W. (view A., chart No. 1,028), leads inside all the reefs.

Burley head open north of Danger point, N.W. by W. $\frac{1}{2}$ W. (view B.), leads between outer and the inner reefs.

Inner Twin peak in line with coast hill, S. by W. $\frac{1}{3}$ W. (view C.), clears the reefs to the eastward.

Passing at night, it is recommended not to shoal the water under 30 fathoms.

Strong ripples or overfalls are found about 8 miles eastward of Danger point, which seem to be due to the deflection of the southerly current by the shoal water off the point, and a strong eddy setting to the northward inside.

The COAST from Danger point to cape Moreton,* between latitude $28^{\circ} 9' S.$ and $27^{\circ} 2' S.$, runs generally North and South, and has no known hidden danger. This portion of the coast includes the two large islands of Stradbroke and Moreton, together with the various passages and channels leading into Moreton bay. The shore, except off the entrance of Rous channel, is steep-to, and may be approached in fine weather within a mile.

Burley Head is 6 miles N.W. by W. $\frac{1}{2}$ W. from Danger point, and forms the next prominent coast feature to the north; it is a bold rocky head, 300 feet high, and bare of trees on its outer part; two small creeks enter the sea on either side of the head, but are only fit for boats in the finest weather.

The coast between Burley head and Danger point forms a slight sandy bight, with a rocky head near the centre, 4 miles from the point. The country behind rises quickly to mountains of considerable elevation, known as the Macpherson range, the highest peaks of which are nearly 4,000 feet above the sea level.

Boat Passage.—From Burley head a low sandy coast runs N.N.W. 8 miles, to a shallow opening, nearly half a mile wide, known as Boat passage; it separates Stradbroke island from the main. The tide runs strongly out of it, causing a heavy bar or break, for a distance of half a mile. Boat passage, can only be entered, in fine weather, with off shore winds, by boats, if they keep close along the Stradbroke island shore.

STRADBROKE ISLAND is 33 miles long, North and South,

* See Admiralty chart, Australia, east coast, sheet XI., Danger point to cape Moreton, with views, No. 1,020; scale, $m = 0.5$ of an inch.

and 6 miles broad in its widest part. The northern portion is high and thickly wooded, rising, in some places, to an elevation of more than 700 feet; but for 13 miles from its south point the island is little else than a low wooded sand-ridge, fronting the sea, and separating it from the head of Moreton bay; it is very narrow in some parts, but generally backed by a belt of swampy land, varying in width from a quarter to upwards of a mile.

From the low south extreme of Stradbroke island to Look-out point, at its north-east part, the outer coast is a straight sandy beach, running nearly North for 31 miles, and clear of any hidden danger. It may be approached within a mile in fine weather, which is of advantage when bound north, as a slight but favourable current is sometimes met with close in.

LOOK-OUT POINT, N. by W. 43 miles from Danger point, is a double-formed rocky point, its summit 260 feet high. The northern part is skirted by rocks, some just above water, but steep-to on the outside.

Boat Rock, one mile N.N.E. from Look-out point, is a small round-topped rock, 4 feet above high water; it may be approached close to. There is a clear passage, 3 cables wide, between this rock and those inside, used in fine weather by steamers bound to and from Brisbane.

Amity Point.—The coast of Stradbroke island turns suddenly from Look-out point W. by N. $\frac{1}{2}$ N., for a distance of 6 miles to Amity point, the low north extreme of Stradbroke island, off which a cluster of shoals, known as South bank, extend N.E. by E. 3 miles.

The coast between Amity and Look-out points is a sandy beach to within $1\frac{1}{2}$ miles of the latter point, at which distance is a low rocky head, where fresh water may be procured when practicable to land.

Anchorage.—Between Look-out and Amity points vessels may anchor, in fine weather, or with off-shore and south-east gales, in from 6 to 8 fathoms. The anchorage is half a mile west of Shag rock, (which is 6 feet above high water,) and bears N.W. by W. one mile from Look-out point.

Vessels intending to anchor, should, after rounding Boat rock steer for Amity point, passing close-to on either side of Shag rock, and come to, where convenient, when west of it, with Look-out point in line, or just open south of the rock, bearing E.S.E. or E. by S. $\frac{1}{2}$ S., distant not more than 2 miles.

Caution.—A vessel should weigh immediately the wind sets in eastward of south-east, so as to be able to clear the banks off Rous channel.

SANDY POINT, the low south extreme of Moreton island, lies one mile N.W. by N. from Amity point; North bank extends $2\frac{1}{2}$ miles eastward from it, forming the northern boundary of Rous channel.

Signal Station.—There is a signal station and a telegraph station on Sandy point in connection with every part of the colonies.

Flat Rock, North 2 miles from Look-out point, is a large low rock, 6 feet above water, and easily distinguished in daytime by the sea breaking over it. This rock may be approached close to, except on the north side, as in that direction, half a mile from it, is a shoal patch, over which the sea breaks heavily in south-east gales.

Caution.—In passing Flat rock at night, with a fresh breeze, care should be observed, it being difficult to make out; and there is, at times, an indraught towards Amity point.

CURRENT.—The coast current runs very strong to the south-east, in the vicinity of Flat rock and Look-out point, causing a heavy, confused, toppling sea with southerly winds.

Rous Channel,* leading into Moreton bay between Amity and Sandy points, is nearly one mile wide, with from 5 to 10 fathoms water between the points; but North and South banks and the bar, between 2 and 3 miles off the entrance, are so exposed to the ocean rollers, that it is generally considered a dangerous channel. The sea always breaks on North bank, but the space over which it breaks on South bank varies with the amount of swell on the coast.

There is not less than 2 fathoms at low-water, spring tides in this channel, except at the point of junction with the Cleveland ship channel, where the depth of water is never less than 9 feet at low-water, spring tides.

Two black beacons, the inner and higher of which is surmounted by a red ball, and visible from Flat rock, are placed on the south extreme point of Moreton island, to guide vessels entering Rous channel between the outer banks and over the bar, in $14\frac{1}{2}$ feet at low-water springs.†

The Current runs to the southward from 2 to 3 knots, close to the outer edge of the bar, and with less velocity over the outer portion of the bank; care should therefore be taken with northerly winds, to prevent a vessel being set to the southward of the line of beacons, until well inside North bank.

* See Admiralty plan, Moreton bay, with views, No. 1,670a, h^2 ; scale $m = 1.5$ inches.

Notwithstanding the great danger attending the navigation of Rous channel, it has been frequently chosen by the masters of steamers and coasters trading between Sydney and Moreton bay.

† Those wishing to use Rous channel can always procure from the Port Office at Brisbane the latest directions and notices of change. Commander Heath, R.N., Port-master, Brisbane, June 1875.

The Tidal Streams set fairly through Rous channel at a rate varying from 2 to 3 knots, until they come within the influence of the coast current.

Buoys and Beacons.—Three red buoys and three beacons mark the northern, and three black buoys and three beacons mark the southern side of the channel for crossing Moreton bay towards Mud island, between the inner banks. Beacons will be erected at those points where required, as soon as, from the nature of the bottom, it is found they can be made permanent.

Caution.—This channel is chiefly available for coasting steamers during daylight when there is not a heavy swell setting in on the coast. It is not recommended for sailing vessels, except in fine weather, with a commanding breeze that will allow them to lie four points to windward of their course; and as the position of the channel over the bar, and the depth of water are liable to considerable change, it should not be attempted by a stranger, without a pilot.

Masters of vessels about leaving Brisbane, and wishing to pass out by Rous channel, can ascertain the state of the wind and sea, by referring to the weather-table at the Port office, which is transmitted daily from Cape Moreton by electric telegraph.

MORETON ISLAND is 20 miles in extreme length, about North and South, and 5 miles broad, near the north end. Portions of it are of considerable elevation, mount Tempest, near the centre of the island, being 910 feet above the level of the sea; and the hills are moderately clothed with trees and scrub, with here and there very conspicuous bare sandy patches. The ridges of hills gradually decrease in elevation as the island narrows towards its southern extremity, near which is a remarkable sand-patch, a striking object from the sea.

The eastern shore of Moreton island, from its south-east point, trends N. $\frac{1}{4}$ W. nearly in a straight line of sandy beach, about 19 miles, to Cape Moreton, the north-east point of the island.

At a distance of 2 miles from North bank of Rous channel, Moreton island may be approached, if necessary, to within a mile, by vessels beating along shore.

CAPE MORETON, on the summit of which is a light-tower in lat. $27^{\circ} 2' 10''$ S., long. $153^{\circ} 29'$ E., and when seen from the southward, appears to be detached, as the land between it and the higher parts of the island is low (view on chart No. 1,029). The lighthouse bears N. by W. $\frac{1}{4}$ W. $24\frac{1}{2}$ miles from Look-out point, and is connected with the pilot station, and Brisbane, by electric telegraph; vessels can communicate by using the Commercial code. If when vessels are leaving the port the weather outside is calm, or the wind is blowing in a different direction

from that inside the cape, signals giving the necessary information will be made from the lighthouse flagstaff.

LIGHT.—The lighthouse on cape Moreton is of white stone, 70 feet high, and exhibits a white light *revolving every minute*, showing a bright face lasting *fifteen seconds*, followed by an eclipse of *forty-five seconds* duration; the light is placed at an elevation of 382 feet above high water, and is visible in clear weather from a distance of 26 miles.

SIGNALS.—The following are the general signals used at the ports of Queensland :—

Pilot	-	-	-	Union jack at the fore.
Pilot-boat	-	-	-	White and red flag horizontal.
Customs	-	-	-	Union jack at the peak.
Water police	-	-	-	Ensign at the main.
Water police.—Night signal	-	-	-	Gun to be fired and a bright light at the peak and mizen.
Steamboat	-	-	-	Rendezvous flag at the peak or mizen.
Gunpowder on board	-	-	-	Union jack at the main.
Health officer	-	-	-	Blue flag at the main.
Medical assistance	-	-	-	No. 5 at the peak.
Mails on board	-	-	-	White flag at the fore, to be kept flying until the mails are delivered.
English mails	-	-	-	Ensign at the fore.
Exemption	-	-	-	White flag at the main.
Exemption.—Night signal	-	-	-	Two bright lights, one 6 feet over the other, hoisted where best seen.
Government emigrants on board	-	-	-	Ensign at the mizen.
Quarantine	-	-	-	Yellow flag at the main.

Weather signals shown from pilot station.—At the masthead the direction of the wind will be shown by the compass signal, section 1, part 1, of the Commercial code.

At the north yard-arm, the state of the sea, by the following flags :—

- W—0 Smooth, with slight undulation.
- Q—1 Short sea or slight swell.
- S—2 Moderate sea or swell.
- J—3 Considerable sea or swell.
- L—4 Heavy sea or swell.
- V—5 Very heavy sea or swell.
- N—6 Very heavy sea and very heavy swell.

With the exception of flags W and N, which are very seldom required the number of divisions in the flags will point out the number indicating the state of the sea.

These signals will be hoisted as soon after sunrise as possible, and kept flying for an hour, and they will also be exhibited at such other times as may be required.

When necessary, the force of the wind will be signalled by the Commercial code (either at the same time or immediately afterwards), from the south yard-arm. The force being indicated by the usual numbers 1 to 12.

When vessels are lying off the watering-place, the signals will, when practicable, be repeated from the pilot-vessel. The compass signals being shown at the mainmast, and the state of the sea at the foremast head.

Pilots.—A vessel from the southward requiring a pilot, should haul up round North point of Moreton island, and keep a good look-out for the pilot-vessel, which cruises off the lighthouse during the day, or for the boat, as the case may be; the arrival of any vessel requiring a pilot being signalled from the lighthouse to the pilot station on Comboyuro point. Strangers should pay attention to any signals made at the lighthouse for their guidance, and not enter without the assistance of a pilot when available. Should the wind be to the southward of E.S.E., or to the westward of N.N.W., vessels may anchor, in 6 fathoms, under the north end of Moreton island, with cape Moreton lighthouse bearing about E.S.E., at $1\frac{1}{2}$ miles from the shore. Vessels arriving at night, and requiring a pilot, should make the necessary signal off cape Moreton.

North Point lies N.W. $\frac{3}{4}$ W. nearly one mile from cape Moreton lighthouse, and has a small hillock upon it, which serves as one of the marks for entering Moreton bay.

LIGHT.—Yellow Patch light, W. $\frac{1}{2}$ S. a little more than one mile from cape Moreton light, is a *fixed* white light, 46 feet above the sea, exhibited from a white hexagonal lighthouse placed near the shore a little eastward of a yellow patch, and is visible for 11 miles, and will show white between the bearings S. $\frac{1}{4}$ W. and S.E. by E. $\frac{1}{8}$ E.; *red* from S.E. by E. $\frac{1}{8}$ E. to the Fairway buoy S.E. by E. $\frac{3}{4}$ E.; and white from S.E. by E. $\frac{3}{4}$ E. to E. $\frac{1}{4}$ N.

The seaward white light kept in sight, leads westward of Hutchinson shoal, and north-eastward of the shoal water extending off North banks.

When the light changes from red to white, on the south-western edge of the red sector, a vessel will be on the line of Yellow Patch light and the Fairway buoy.

Smith Rock.—This dangerous conical rock, with only 7 feet water over it, and 3 and 4 fathoms close-to, lies nearly midway between the outer

extreme of cape Moreton and Flinders reef, with cape Moreton lighthouse bearing S. by W. $\frac{1}{4}$ W. distant 2 miles. A black buoy is moored in 10 fathoms, 3 cables S.S.W. of the rock. Mount Tempest, in line with cape Cliff, the eastern extreme of Moreton island, bearing S. by W. $\frac{3}{4}$ W., leads one third of a mile eastward; and Ridge Tree hill, in line with the hummock on North point, S.W. $\frac{1}{4}$ W., leads half a mile south of the rock (View G., plan No. 1,570a.).

By night cape Moreton light kept westward of S.S.W. $\frac{1}{4}$ W., will ensure being seaward of this danger.

Flinders Reef, awash at high water, with the exception of two small heads, which are 5 feet above, is flat-topped, and upwards of half a mile in circumference; its south part bears N. $\frac{3}{4}$ E. 3 miles from cape Moreton. The reef is bold close-to, and may be easily made out by the sea breaking heavily upon it.

Hutchison Shoal, N. $\frac{1}{4}$ E. 2 miles from Flinders reef, and nearly $5\frac{1}{2}$ miles from cape Moreton, though not having less than 22 feet water on it, is dangerous to ships of great draught, and should be avoided by loaded coasters, on account of broken water, when the $1\frac{1}{2}$ -knot E.S.E. current sets against a strong easterly wind.

Cape Moreton lighthouse in line with the centre of Flinders reef leads outside Hutchison shoal; and to ensure being inside it, bring mount Tempest in line with the inner Yellow patch, just west of the low light, bearing S. $\frac{3}{4}$ W.; to pass about $1\frac{1}{2}$ miles northward of it, Beerwah the north-western and highest of the Glass House mountains, the remarkable peaks on the mainland to the west, should not bear westward of W. $\frac{3}{4}$ S.

At night, vessels are westward of this shoal while Yellow-patch light is in sight.

MORETON BAY, through which the port and river of Brisbane is approached, is the extensive sheet of water separating Stradbroke and Moreton islands from the mainland. Its entrance lies between the North point of Moreton island and Caloundra head, bearing from each other N.W. by W. $\frac{1}{4}$ W. and S.E. by E. $\frac{1}{4}$ E. distant $21\frac{1}{2}$ miles. It is 35 miles long North and South, and 13 miles broad, narrowing gradually to the southward. A great portion of the bay is encumbered by shoals, but two good channels into the bay have now been examined, viz., North and Ship or Main: of these shoals, those nearest to Ship or Main are known as North, East, Salamander, Venus, Central, and Middle banks. The outer edges of North and East banks, across the entrance of the bay, can easily be seen from the sea breaking upon them; and may be readily distinguished from the masthead in calm weather, as the water is generally clear, and the sand very white.

Anchorage may be found in any part of the bay, among the shoals,

but when north and north-east winds prevail a heavy sea sets in, and the tide runs strong in their vicinity; so it is advisable, if possible, to anchor in a clear space, where the tide is weaker.

COMBOYURO POINT.—Comboyuro point, the west extreme of Moreton island, is a low sandy point, steep-to on its west side; it bears S.W. by W. $\frac{1}{4}$ W. $5\frac{1}{2}$ miles from North point. The intermediate and nearly straight sandy beach is fronted by sand-flats extending from one to 3 cables off shore, and backed by a ridge of scrubby hills from 100 to 350 feet high.

LIGHT.—From a white wooden lighthouse on Comboyuro point, a *fixed* light is shown, 20 feet above the sea and visible 9 miles. The light shows *red* seaward, between the land of Moreton island and the bearing of S. by W. $\frac{1}{4}$ W.; is obscured over East banks, between S. by W. $\frac{1}{4}$ W. and S. by E. $\frac{1}{2}$ E.; white from S. by E. $\frac{1}{2}$ E. to E.N.E.; is obscured from E.N.E. to N. $\frac{1}{2}$ E.; and white from N. $\frac{1}{2}$ E. to N. by W.

The **Pilot Station** is a mile South of Comboyuro lighthouse, and has telegraphic communication with cape Moreton and Brisbane. Moorings are laid in 7 fathoms close to the beach for the pilot vessel. The edge of the bank is steep-to, deepening to 14 fathoms suddenly; and the tide runs strongly past the station.

COWAN COWAN POINT bears S. by E. $4\frac{1}{2}$ miles from Comboyuro lighthouse; it is low and steep-to, having 10 fathoms within a cable of the beach. The shore between this point and Comboyuro curves slightly inwards, and as far as the pilot station is fronted by a shoal or ledge of sand extending from one to 3 cables off, which is steep-to. The tide runs strong abreast Cowan Cowan point, causing in heavy south-east winds a short rippling sea dangerous to small craft.

LIGHT.—A *fixed* light is exhibited from Cowan Cowan point, 56 feet above the sea and visible 12 miles; showing white from S. by E. $\frac{1}{2}$ E. to E. $\frac{3}{4}$ N.; obscured over Central banks, from E. $\frac{3}{4}$ N. to N.E. $\frac{1}{2}$ N.; white from N.E. $\frac{1}{2}$ N. to N.N.E.; obscured over Middle banks from N.N.E. to N. by E. $\frac{1}{2}$ E.; *red* from N. by E. $\frac{1}{2}$ E. to about North, but obscured eastward of this latter bearing.

Tangalooma Point, off which a shoal extends 3 cables, bears S. by E. $4\frac{1}{2}$ miles from Cowan Cowan lighthouse, and falls abruptly into the sea from a summit or shoulder 260 feet high, which is conspicuous from the northward, and rendered more so by a remarkable white patch of sand, half a mile north of the point. This object is known by the name of Tangalooma or Ship patch, from its resemblance to a vessel under full sail. The coast between Tangalooma and Cowan Cowan point is a ridge of scrubby sand-hills, 150 to 300 feet high, and forms a slight bight, having deep water within a short distance of the beach from Ship patch to $1\frac{1}{2}$ miles of Cowan Cowan point.

North Banks.—The North banks are 10 miles in length E.S.E. and W.N.W., and their greatest width is 5 miles at the south-east end, with $1\frac{1}{2}$ fathoms on the shoalest part. The east extreme of these banks, with $2\frac{1}{4}$ to $3\frac{3}{4}$ fathoms on it, is N.N.W. $\frac{1}{4}$ W. $6\frac{1}{2}$ miles, and their projecting south extreme N.W. $\frac{1}{2}$ N., $5\frac{1}{4}$ miles from Comboyuro point. Within a mile of their south edge is as little as 9 feet. The sea breaks heavily over these banks, and the ebb stream sets strong to the N.N.E.; they are steep-to on the western side.

Cape Moreton lighthouse open eastward of outer white patch S.E. by E. $\frac{1}{2}$ E. (view I., plan No. 1670a) leads eastward of North banks.

Wilds Bank, with $3\frac{1}{4}$ to $4\frac{3}{4}$ fathoms, is of small extent, and half a mile from the south edge of North banks, separated from them by a narrow channel.

East Banks are three in number, and separate Main and Middle channels; they are $3\frac{1}{2}$ miles long in an East and West direction, and nearly a mile wide in the broadest part. The average depth over them is from 2 to 3 fathoms, but in their north-east part it is only 9 feet. Their eastern extreme in 2 fathoms, lies N. by E. 3 miles from Comboyuro point, and the west edge in $2\frac{1}{2}$ fathoms bears N.W. $4\frac{1}{4}$ miles from the same point; the north edge is well marked by the buoys in Main channel.

NORTH CHANNEL, into Moreton bay, lies between North banks and Bribie island, and includes a large space of clear water 2 to 4 miles wide with depths of 4 to 10 fathoms. The entrance to the channel is between Caloundra head and the north-west point of North banks S.S.E. $\frac{1}{2}$ E. $4\frac{1}{2}$ miles from the head; two patches of $3\frac{1}{2}$ and $2\frac{3}{4}$ fathoms, lie respectively S.S.E. 2 miles, and S.E. by S. 3 miles from Caloundra head. The channel is not buoyed.

It is the deepest and widest channel into Moreton bay, but from the distance of its entrance, 17 miles, to the Pilot station at Comboyuro point it is little known or used. Its navigation is easy as far as Spitfire banks, but beyond care is required and a good look-out from aloft to reach Pearl or Main channels. With off-shore winds, vessels entering the bay may use this channel to advantage, as the intricacies and strong tides of the other channels nearer Moreton island would be avoided.

SHIP or MAIN CHANNEL,*—*see foot note*—in to Moreton bay, which should always be used by large vessels, with the assistance of a pilot, is bounded at its north entrance on the north side by North banks, and to the southward by East banks. This entrance is nearly 2 miles wide between the east and north-east edges of the above-mentioned banks, the fairway being marked by a black buoy, with a flag on it, usually known

* **Caution.**—On the eve of sending this volume to press, information was received from the Queensland Government, that Ship channel was closed, and the buoys removed.

as the Fairway buoy, moored in 7 fathoms, half a mile North of the north-east spit of East banks ; with cape Moreton lighthouse bearing E.S.E. nearly, and Comboyuro point S. by E.

Buoys.—Buoy A, black, in 6 fathoms, 2 cables North of the north edge of the East banks, bears S.W. $\frac{1}{2}$ W, one mile from the Fairway buoy. Buoy B, chequered black and white, in $6\frac{1}{2}$ fathoms, bears S.W. $\frac{1}{4}$ W. nearly 2 miles from buoy A, and N.W. $4\frac{3}{4}$ miles from Comboyuro point lighthouse ; it is placed off the west spit of East banks, at the first bend or elbow of Main channel, which is here only one-third of a mile wide between buoy B and Wilds bank. There are $6\frac{1}{2}$ fathoms close to the buoy and $3\frac{1}{2}$ to 4 fathoms half a mile west of it.

Caution.—As the buoys may sometimes be altered as the banks shift, and those in exposed situations are liable to break adrift in heavy gales, or be temporarily replaced by buoys of a different character from those described, they must not be too much depended upon.

HOWE CHANNEL leads through a gap in East banks in a southerly direction from Main channel into Harbour reach and Moreton bay ; its entrance is half a mile South of Fairway buoy, and is 3 cables wide, with from 3 to $3\frac{3}{4}$ fathoms. This channel is often used in fine weather by vessels either entering or bound northwards, and at times may be used when there is danger in taking the Middle channel, *see* below, but its direction sometimes shifts after heavy weather.

Venus Bank extends North of Comboyuro point for $2\frac{1}{2}$ miles, and is a mile wide in some places ; the least water over it is 7 feet. The tide sets strongly over the bank, causing eddies and tide ripples along its west edge. The shape of this bank alters after heavy gales.

The summit of Tangalooma point, in line with Cowan Cowan lighthouse, bearing S. by E. $\frac{1}{2}$ E., leads one cable clear of its west edge, which is steep-to.

MIDDLE CHANNEL leads between East and Venus banks into Harbour reach, at a distance of 3 miles from Comboyuro point ; it is $1\frac{1}{2}$ miles long, East and West, and from 2 to 3 cables wide. There are at present 3 buoys in this channel ; one black buoy, inside the west entrance, near the north-west part of Venus bank, bearing N. by W. $\frac{1}{2}$ W. 3 miles from Comboyuro point ; a red buoy placed south-west of a knoll with only 9 feet ; and another red buoy on the north side of the east entrance.

This channel, generally used by vessels drawing 12 feet trading to Moreton bay, has at times 18 feet at low-water springs ; its depth and direction shift occasionally, and it should not be taken without a pilot. During East and S.E. gales there is a heavy breaking sea, especially on the ebb, the channel is then dangerous, *see* page 93.

rocks extending $1\frac{1}{2}$ cables from Cook island, which is used by steam vessels and small craft, in fine weather, during daylight.

Clearing Marks.—Danger point seen midway between Cook island and Guy rock, bearing N.W. $\frac{1}{2}$ W. (view A., chart No. 1,028), leads inside all the reefs.

Burley head open north of Danger point, N.W. by W. $\frac{1}{2}$ W. (view B.), leads between outer and the inner reefs.

Inner Twin peak in line with coast hill, S. by W. $\frac{1}{2}$ W. (view C.), clears the reefs to the eastward.

Passing at night, it is recommended not to shoal the water under 30 fathoms.

Strong ripples or overfalls are found about 8 miles eastward of Danger point, which seem to be due to the deflection of the southerly current by the shoal water off the point, and a strong eddy setting to the northward inside.

The COAST from Danger point to cape Moreton,* between latitude $28^{\circ} 9' S.$ and $27^{\circ} 2' S.$, runs generally North and South, and has no known hidden danger. This portion of the coast includes the two large islands of Stradbroke and Moreton, together with the various passages and channels leading into Moreton bay. The shore, except off the entrance of Rous channel, is steep-to, and may be approached in fine weather within a mile.

Burley Head is 6 miles N.W. by W. $\frac{1}{2}$ W. from Danger point, and forms the next prominent coast feature to the north; it is a bold rocky head, 300 feet high, and bare of trees on its outer part; two small creeks enter the sea on either side of the head, but are only fit for boats in the finest weather.

The coast between Burley head and Danger point forms a slight sandy bight, with a rocky head near the centre, 4 miles from the point. The country behind rises quickly to mountains of considerable elevation, known as the Macpherson range, the highest peaks of which are nearly 4,000 feet above the sea level.

Boat Passage.—From Burley head a low sandy coast runs N.N.W. 8 miles, to a shallow opening, nearly half a mile wide, known as Boat passage; it separates Stradbroke island from the main. The tide runs strongly out of it, causing a heavy bar or break, for a distance of half a mile. Boat passage, can only be entered, in fine weather, with off shore winds, by boats, if they keep close along the Stradbroke island shore.

STRADBROKE ISLAND is 33 miles long, North and South,

* See Admiralty chart, Australia, east coast, sheet XI., Danger point to cape Moreton, with views, No. 1,020; scale, $m = 0.5$ of an inch.

and 6 miles broad in its widest part. The northern portion is high and thickly wooded, rising, in some places, to an elevation of more than 700 feet; but for 13 miles from its south point the island is little else than a low wooded sand-ridge, fronting the sea, and separating it from the head of Moreton bay; it is very narrow in some parts, but generally backed by a belt of swampy land, varying in width from a quarter to upwards of a mile.

From the low south extreme of Stradbroke island to Look-out point, at its north-east part, the outer coast is a straight sandy beach, running nearly North for 31 miles, and clear of any hidden danger. It may be approached within a mile in fine weather, which is of advantage when bound north, as a slight but favourable current is sometimes met with close in.

LOOK-OUT POINT, N. by W. 43 miles from Danger point, is a double-formed rocky point, its summit 260 feet high. The northern part is skirted by rocks, some just above water, but steep-to on the outside.

Boat Rock, one mile N.N.E. from Look-out point, is a small round-topped rock, 4 feet above high water; it may be approached close to. There is a clear passage, 3 cables wide, between this rock and those inside, used in fine weather by steamers bound to and from Brisbane.

Amity Point.—The coast of Stradbroke island turns suddenly from Look-out point W. by N. $\frac{1}{2}$ N., for a distance of 6 miles to Amity point, the low north extreme of Stradbroke island, off which a cluster of shoals, known as South bank, extend N.E. by E. 3 miles.

The coast between Amity and Look-out points is a sandy beach to within $1\frac{1}{2}$ miles of the latter point, at which distance is a low rocky head, where fresh water may be procured when practicable to land.

Anchorage.—Between Look-out and Amity points vessels may anchor, in fine weather, or with off-shore and south-east gales, in from 6 to 8 fathoms. The anchorage is half a mile west of Shag rock, (which is 6 feet above high water,) and bears N.W. by W. one mile from Look-out point.

Vessels intending to anchor, should, after rounding Boat rock steer for Amity point, passing close-to on either side of Shag rock, and come to, where convenient, when west of it, with Look-out point in line, or just open south of the rock, bearing E.S.E. or E. by S. $\frac{1}{2}$ S., distant not more than 2 miles.

Caution.—A vessel should weigh immediately the wind sets in eastward of south-east, so as to be able to clear the banks off Rous channel.

SANDY POINT, the low south extreme of Moreton island, lies one mile N.W. by N. from Amity point; North bank extends $2\frac{1}{2}$ miles eastward from it, forming the northern boundary of Rous channel.

Signal Station.—There is a signal station and a telegraph station on Sandy point in connection with every part of the colonies.

Flat Rock, North 2 miles from Look-out point, is a large low rock, 6 feet above water, and easily distinguished in daytime by the sea breaking over it. This rock may be approached close to, except on the north side, as in that direction, half a mile from it, is a shoal patch, over which the sea breaks heavily in south-east gales.

Caution.—In passing Flat rock at night, with a fresh breeze, care should be observed, it being difficult to make out; and there is, at times, an indraught towards Amity point.

CURRENT.—The coast current runs very strong to the south-east, in the vicinity of Flat rock and Look-out point, causing a heavy, confused, toppling sea with southerly winds.

Rous Channel,* leading into Moreton bay between Amity and Sandy points, is nearly one mile wide, with from 5 to 10 fathoms water between the points; but North and South banks and the bar, between 2 and 3 miles off the entrance, are so exposed to the ocean rollers, that it is generally considered a dangerous channel. The sea always breaks on North bank, but the space over which it breaks on South bank varies with the amount of swell on the coast.

There is not less than 2 fathoms at low-water, spring tides in this channel, except at the point of junction with the Cleveland ship channel, where the depth of water is never less than 9 feet at low-water, spring tides.

Two black beacons, the inner and higher of which is surmounted by a red ball, and visible from Flat rock, are placed on the south extreme point of Moreton island, to guide vessels entering Rous channel between the outer banks and over the bar, in $14\frac{1}{2}$ feet at low-water springs.†

The Current runs to the southward from 2 to 3 knots, close to the outer edge of the bar, and with less velocity over the outer portion of the bank; care should therefore be taken with northerly winds, to prevent a vessel being set to the southward of the line of beacons, until well inside North bank.

* See Admiralty plan, Moreton bay, with views, No. 1,670a, b; scale $m = 1.5$ inches.

Notwithstanding the great danger attending the navigation of Rous channel, it has been frequently chosen by the masters of steamers and coasters trading between Sydney and Moreton bay.

† Those wishing to use Rous channel can always procure from the Port Office at Brisbane the latest directions and notices of change. Commander Heath, R.N., Port-master, Brisbane, June 1875.

from that inside the cape, signals giving the necessary information will be made from the lighthouse flagstaff.

LIGHT.—The lighthouse on cape Moreton is of white stone, 70 feet high, and exhibits a white light *revolving every minute*, showing a bright face lasting *fifteen seconds*, followed by an eclipse of *forty-five seconds* duration; the light is placed at an elevation of 382 feet above high water, and is visible in clear weather from a distance of 26 miles.

SIGNALS.—The following are the general signals used at the ports of Queensland :—

Pilot	-	-	-	Union jack at the fore.
Pilot-boat	-	-	-	White and red flag horizontal.
Customs	-	-	-	Union jack at the peak.
Water police	-	-	-	Ensign at the main.
Water police.—Night signal	-	-	-	Gun to be fired and a bright light at the peak and mizen.
Steamboat	-	-	-	Rendezvous flag at the peak or mizen.
Gunpowder on board	-	-	-	Union jack at the main.
Health officer	-	-	-	Blue flag at the main.
Medical assistance	-	-	-	No. 5 at the peak.
Mails on board	-	-	-	White flag at the fore, to be kept flying until the mails are delivered.
English mails	-	-	-	Ensign at the fore.
Exemption	-	-	-	White flag at the main.
Exemption.—Night signal	-	-	-	Two bright lights, one 6 feet over the other, hoisted where best seen.
Government emigrants on board	-	-	-	Ensign at the mizen.
Quarantine	-	-	-	Yellow flag at the main.

Weather signals shown from pilot station.—At the masthead the direction of the wind will be shown by the compass signal: section 1, part 1, of the Commercial code.

At the north yard-arm, the state of the sea, by the following flags :—

- W—0 Smooth, with slight undulation.
- Q—1 Short sea or slight swell.
- S—2 Moderate sea or swell.
- J—3 Considerable sea or swell.
- L—4 Heavy sea or swell.
- V—5 Very heavy sea or swell.
- N—6 Very heavy sea and very heavy swell.

With the exception of flags W and N, which are very seldom required the number of divisions in the flags will point out the number indicating the state of the sea.

These signals will be hoisted as soon after sunrise as possible, and kept flying for an hour, and they will also be exhibited at such other times as may be required.

When necessary, the force of the wind will be signalled by the Commercial code (either at the same time or immediately afterwards), from the south yard-arm. The force being indicated by the usual numbers 1 to 12.

When vessels are lying off the watering-place, the signals will, when practicable, be repeated from the pilot-vessel. The compass signals being shown at the mainmast, and the state of the sea at the foremast head.

Pilots.—A vessel from the southward requiring a pilot, should haul up round North point of Moreton island, and keep a good look-out for the pilot-vessel, which cruises off the lighthouse during the day, or for the boat, as the case may be; the arrival of any vessel requiring a pilot being signalled from the lighthouse to the pilot station on Comboyuro point. Strangers should pay attention to any signals made at the lighthouse for their guidance, and not enter without the assistance of a pilot when available. Should the wind be to the southward of E.S.E., or to the westward of N.N.W., vessels may anchor, in 6 fathoms, under the north end of Moreton island, with cape Moreton lighthouse bearing about E.S.E., at $1\frac{1}{2}$ miles from the shore. Vessels arriving at night, and requiring a pilot, should make the necessary signal off cape Moreton.

North Point lies N.W. $\frac{3}{4}$ W. nearly one mile from cape Moreton lighthouse, and has a small hillock upon it, which serves as one of the marks for entering Moreton bay.

LIGHT.—Yellow Patch light, W. $\frac{1}{2}$ S. a little more than one mile from cape Moreton light, is a *fixed* white light, 46 feet above the sea, exhibited from a white hexagonal lighthouse placed near the shore a little eastward of a yellow patch, and is visible for 11 miles, and will show white between the bearings S. $\frac{1}{2}$ W. and S.E. by E. $\frac{1}{2}$ E.; *red* from S.E. by E. $\frac{1}{2}$ E. to the Fairway buoy S.E. by E. $\frac{3}{4}$ E.; and white from S.E. by E. $\frac{3}{4}$ E. to E. $\frac{1}{4}$ N.

The seaward white light kept in sight, leads westward of Hutchinson shoal, and north-eastward of the shoal water extending off North banks.

When the light changes from red to white, on the south-western edge of the red sector, a vessel will be on the line of Yellow Patch light and the Fairway buoy.

Smith Rock.—This dangerous conical rock, with only 7 feet water over it, and 3 and 4 fathoms close-to, lies nearly midway between the outer

extreme of cape Moreton and Flinders reef, with cape Moreton lighthouse bearing S. by W. $\frac{1}{4}$ W. distant 2 miles. A black buoy is moored in 10 fathoms, 3 cables S.S.W. of the rock. Mount Tempest, in line with cape Cliff, the eastern extreme of Moreton island, bearing S. by W. $\frac{3}{4}$ W., leads one third of a mile eastward ; and Ridge Tree hill, in line with the hummock on North point, S.W. $\frac{3}{4}$ W., leads half a mile south of the rock (View G., plan No. 1,670a.).

By night cape Moreton light kept westward of S.S.W. $\frac{1}{4}$ W., will ensure being seaward of this danger.

Flinders Reef, awash at high water, with the exception of two small heads, which are 5 feet above, is flat-topped, and upwards of half a mile in circumference; its south part bears N. $\frac{3}{4}$ E. 3 miles from cape Moreton. The reef is bold close-to, and may be easily made out by the sea breaking heavily upon it.

Hutchison Shoal, N. $\frac{1}{4}$ E. 2 miles from Flinders reef, and nearly $5\frac{1}{2}$ miles from cape Moreton, though not having less than 22 feet water on it, is dangerous to ships of great draught, and should be avoided by loaded coasters, on account of broken water, when the $1\frac{1}{2}$ -knot E.S.E. current sets against a strong easterly wind.

Cape Moreton lighthouse in line with the centre of Flinders reef leads outside Hutchison shoal; and to ensure being inside it, bring mount Tempest in line with the inner Yellow patch, just west of the low light, bearing S. $\frac{3}{4}$ W.; to pass about $1\frac{1}{2}$ miles northward of it, Beerwah the north-western and highest of the Glass House mountains, the remarkable peaks on the mainland to the west, should not bear westward of W. $\frac{3}{4}$ S.

At night, vessels are westward of this shoal while Yellow-patch light is in sight.

MORETON BAY, through which the port and river of Brisbane is approached, is the extensive sheet of water separating Stradbroke and Moreton islands from the mainland. Its entrance lies between the North point of Moreton island and Caloundra head, bearing from each other N.W. by W. $\frac{1}{4}$ W. and S.E. by E. $\frac{1}{4}$ E. distant $21\frac{1}{2}$ miles. It is 35 miles long North and South, and 13 miles broad, narrowing gradually to the southward. A great portion of the bay is encumbered by shoals, but two good channels into the bay have now been examined, viz., North and Ship or Main: of these shoals, those nearest to Ship or Main are known as North, East, Salamander, Venus, Central, and Middle banks. The outer edges of North and East banks, across the entrance of the bay, can easily be seen from the sea breaking upon them; and may be readily distinguished from the masthead in calm weather, as the water is generally clear, and the sand very white.

Anchorage may be found in any part of the bay, among the shoals,

but when north and north-east winds prevail a heavy sea sets in, and the tide runs strong in their vicinity; so it is advisable, if possible, to anchor in a clear space, where the tide is weaker.

COMBOYURO POINT.—Comboyuro point, the west extreme of Moreton island, is a low sandy point, steep-to on its west side; it bears S.W. by W. $\frac{1}{4}$ W. $5\frac{1}{2}$ miles from North point. The intermediate and nearly straight sandy beach is fronted by sand-flats extending from one to 3 cables off shore, and backed by a ridge of scrubby hills from 100 to 350 feet high.

LIGHT.—From a white wooden lighthouse on Comboyuro point, a *fixed* light is shown, 20 feet above the sea and visible 9 miles. The light shows *red* seaward, between the land of Moreton island and the bearing of S. by W. $\frac{1}{4}$ W.; is obscured over East banks, between S. by W. $\frac{1}{4}$ W. and S. by E $\frac{1}{2}$ E.; white from S. by E. $\frac{1}{2}$ E. to E.N.E.; is obscured from E.N.E. to N. $\frac{1}{2}$ E.; and white from N. $\frac{1}{2}$ E. to N. by W.

The **Pilot Station** is a mile South of Comboyuro lighthouse, and has telegraphic communication with cape Moreton and Brisbane. Moorings are laid in 7 fathoms close to the beach for the pilot vessel. The edge of the bank is steep-to, deepening to 14 fathoms suddenly; and the tide runs strongly past the station.

COWAN COWAN POINT bears S. by E. $4\frac{1}{4}$ miles from Comboyuro lighthouse; it is low and steep-to, having 10 fathoms within a cable of the beach. The shore between this point and Comboyuro curves slightly inwards, and as far as the pilot station is fronted by a shoal or ledge of sand extending from one to 3 cables off, which is steep-to. The tide runs strong abreast Cowan Cowan point, causing in heavy south-east winds a short rippling sea dangerous to small craft.

LIGHT.—A *fixed* light is exhibited from Cowan Cowan point, 56 feet above the sea and visible 12 miles; showing white from S. by E. $\frac{1}{2}$ E. to E. $\frac{3}{4}$ N.; obscured over Central banks, from E. $\frac{3}{4}$ N. to N.E. $\frac{1}{2}$ N.; white from N.E. $\frac{1}{2}$ N. to N.N.E.; obscured over Middle banks from N.N.E. to N. by E. $\frac{1}{2}$ E.; *red* from N. by E. $\frac{1}{2}$ E. to about North, but obscured eastward of this latter bearing.

Tangalooma Point, off which a shoal extends 3 cables, bears S. by E. $4\frac{1}{4}$ miles from Cowan Cowan lighthouse, and falls abruptly into the sea from a summit or shoulder 260 feet high, which is conspicuous from the northward, and rendered more so by a remarkable white patch of sand, half a mile north of the point. This object is known by the name of Tangalooma or Ship patch, from its resemblance to a vessel under full sail. The coast between Tangalooma and Cowan Cowan point is a ridge of scrubby sand-hills, 150 to 300 feet high, and forms a slight bight, having deep water within a short distance of the beach from Ship patch to $1\frac{1}{2}$ miles of Cowan Cowan point.

North Banks.—The North banks are 10 miles in length E.S.E. and W.N.W., and their greatest width is 5 miles at the south-east end, with $1\frac{1}{2}$ fathoms on the shoalest part. The east extreme of these banks, with $2\frac{1}{4}$ to $3\frac{3}{4}$ fathoms on it, is N.N.W. $\frac{1}{4}$ W. $6\frac{1}{2}$ miles, and their projecting south extreme N.W. $\frac{1}{2}$ N., $5\frac{1}{4}$ miles from Comboyuro point. Within a mile of their south edge is as little as 9 feet. The sea breaks heavily over these banks, and the ebb stream sets strong to the N.N.E.; they are steep-to on the western side.

Cape Moreton lighthouse open eastward of outer white patch S.E. by E. $\frac{1}{2}$ E. (view I., plan No. 1670a) leads eastward of North banks.

Wilds Bank, with $3\frac{1}{4}$ to $4\frac{3}{4}$ fathoms, is of small extent, and half a mile from the south edge of North banks, separated from them by a narrow channel.

East Banks are three in number, and separate Main and Middle channels; they are $3\frac{1}{2}$ miles long in an East and West direction, and nearly a mile wide in the broadest part. The average depth over them is from 2 to 3 fathoms, but in their north-east part it is only 9 feet. Their eastern extreme in 2 fathoms, lies N. by E. 3 miles from Comboyuro point, and the west edge in $2\frac{1}{2}$ fathoms bears N.W. $4\frac{1}{2}$ miles from the same point; the north edge is well marked by the buoys in Main channel.

NORTH CHANNEL, into Moreton bay, lies between North banks and Bribie island, and includes a large space of clear water 2 to 4 miles wide with depths of 4 to 10 fathoms. The entrance to the channel is between Caloundra head and the north-west point of North banks S.S.E. $\frac{1}{2}$ E. $4\frac{1}{2}$ miles from the head; two patches of $3\frac{1}{2}$ and $2\frac{3}{4}$ fathoms, lie respectively S.S.E. 2 miles, and S.E. by S. 3 miles from Caloundra head. The channel is not buoyed.

It is the deepest and widest channel into Moreton bay, but from the distance of its entrance, 17 miles, to the Pilot station at Comboyuro point it is little known or used. Its navigation is easy as far as Spitfire banks, but beyond care is required and a good look-out from aloft to reach Pearl or Main channels. With off-shore winds, vessels entering the bay may use this channel to advantage, as the intricacies and strong tides of the other channels nearer Moreton island would be avoided.

SHIP or MAIN CHANNEL,*—*see foot note*—in to Moreton bay, which should always be used by large vessels, with the assistance of a pilot, is bounded at its north entrance on the north side by North banks, and to the southward by East banks. This entrance is nearly 2 miles wide between the east and north-east edges of the above-mentioned banks, the fairway being marked by a black buoy, with a flag on it, usually known

* **Caution.**—On the eve of sending this volume to press, information was received from the Queensland Government, that Ship channel was closed, and the buoys removed.

as the Fairway buoy, moored in 7 fathoms, half a mile North of the north-east spit of East banks ; with cape Moreton lighthouse bearing E.S.E. nearly, and Comboyuro point S. by E.

Buoys.—Buoy A, black, in 6 fathoms, 2 cables North of the north edge of the East banks, bears S.W. $\frac{1}{2}$ W., one mile from the Fairway buoy. Buoy B, chequered black and white, in $6\frac{1}{4}$ fathoms, bears S.W. $\frac{1}{2}$ W. nearly 2 miles from buoy A, and N.W. $4\frac{3}{4}$ miles from Comboyuro point lighthouse ; it is placed off the west spit of East banks, at the first bend or elbow of Main channel, which is here only one-third of a mile wide between buoy B and Wilds bank. There are $6\frac{1}{2}$ fathoms close to the buoy and $3\frac{1}{2}$ to 4 fathoms half a mile west of it.

Caution.—As the buoys may sometimes be altered as the banks shift, and those in exposed situations are liable to break adrift in heavy gales, or be temporarily replaced by buoys of a different character from those described, they must not be too much depended upon.

HOWE CHANNEL leads through a gap in East banks in a southerly direction from Main channel into Harbour reach and Moreton bay ; its entrance is half a mile South of Fairway buoy, and is 3 cables wide, with from 3 to $3\frac{3}{4}$ fathoms. This channel is often used in fine weather by vessels either entering or bound northwards, and at times may be used when there is danger in taking the Middle channel, *see* below, but its direction sometimes shifts after heavy weather.

Venus Bank extends North of Comboyuro point for $2\frac{1}{2}$ miles, and is a mile wide in some places ; the least water over it is 7 feet. The tide sets strongly over the bank, causing eddies and tide ripples along its west edge. The shape of this bank alters after heavy gales.

The summit of Tangalooma point, in line with Cowan Cowan lighthouse, bearing S. by E. $\frac{1}{2}$ E., leads one cable clear of its west edge, which is steep-to.

MIDDLE CHANNEL leads between East and Venus banks into Harbour reach, at a distance of 3 miles from Comboyuro point ; it is $1\frac{1}{2}$ miles long, East and West, and from 2 to 3 cables wide. There are at present 3 buoys in this channel ; one black buoy, inside the west entrance, near the north-west part of Venus bank, bearing N. by W. $\frac{1}{2}$ W. 3 miles from Comboyuro point ; a red buoy placed south-west of a knoll with only 9 feet ; and another red buoy on the north side of the east entrance.

This channel, generally used by vessels drawing 12 feet trading to Moreton bay, has at times 18 feet at low-water springs ; its depth and direction shift occasionally, and it should not be taken without a pilot. During East and S.E. gales there is a heavy breaking sea, especially on the ebb, the channel is then dangerous, *see* page 93.

Freeman Channel, between Venus bank and the north shore of Moreton island, should not be used by strangers, and is only fit for vessels drawing less than 9 feet water. Its depth is constantly changing. Two red buoys are placed in the channel, which are shifted as the banks alter.

It is not recommended with fresh north or north-east winds.

Hixson Bank is a narrow sand-ridge running nearly North and South, with 15 feet over its shoalest parts; the north extreme bears N.W. by N. $3\frac{1}{4}$ miles from Comboyuro point lighthouse. Its length is $2\frac{1}{4}$ miles, and a black buoy is placed in 4 fathoms at the south extreme one mile W.N.W. from Comboyuro point.

HARBOUR REACH, a bend of Main channel, leads into Moreton bay; it is bounded to the eastward by East and Hixson banks, and westward by Salamander bank; its average breadth is about three-quarters of a mile, with from 5 to 13 fathoms.

The tide stream when it runs with much strength against a strong breeze causes a confused sea in the reach. See page 90.

Salamander Bank.—The north extreme is $1\frac{1}{4}$ miles S.S.E. from buoy B, and the bank extends $3\frac{1}{2}$ miles in the same direction. Its greatest breadth near the southern part is three-quarters of a mile. There are from 5 to 18 feet over it, the bank being composed of shoal ridges with deeper water between them.

A red buoy is placed on the north-east side of Salamander bank, close to 6-foot water; it is moored in 3 fathoms and bears S.E. by S. 2 miles from buoy B. The north extreme of the bank shifts occasionally.

YULE ROAD, abreast the pilot station of Comboyuro point, affords anchorage during fine weather in from 5 to 8 fathoms, sandy bottom, at a distance of half to three-quarters of a mile from the shore. The best position is with Ship patch just open of Cowan Cowan point bearing S. by E. $\frac{1}{4}$ E., and the houses at the pilot station East. This anchorage is better than that closer in, as the tide runs with much less strength, and the water is not so deep. Small vessels, however, would find it more convenient to anchor close in on the bank abreast the water holes in from $2\frac{1}{4}$ to 3 fathoms, about 2 or 3 cables from the beach. They will be more out of the tide, and better sheltered from the strong north-east and south-east gales which often prevail.

Yule roads can only be recommended as a stopping place; a heavy sea sets in with east and east-south-east gales, often causing vessels to part their chains; when lying at single anchor care should be taken to keep it clear.

Yule Bank forms the southern limit of Yule road; it is 2 miles long in an E.S.E. and W.N.W. direction, and nearly half a mile wide; the least water over it is 9 feet near the centre. A red buoy is placed at

its eastern prong in $3\frac{1}{2}$ fathoms, and bears S. by W. $1\frac{1}{2}$ miles from Comboyuro lighthouse.

Between Salamander and Yule banks is a narrow passage with $3\frac{1}{2}$ fathoms ; and to the southward of the latter a deep channel nearly $1\frac{1}{2}$ miles wide leads from Main to Pearl channel.

Supplies.—Whalers and other vessels would find Yule road a convenient place for taking in wood and water ; the latter is supplied from the never failing streams running into the sea 2 miles South of Comboyuro point. Wood is also plentiful, the harder qualities are well adapted for steaming. Fish is abundant, and may be caught alongside with hook and line, or by hauling the seine on the beach.

CENTRAL BANKS, which are composed of sand, are of considerable extent, and most complex and varied in shape ; they lie on the west side of Main channel south of Yule bank ; separated from the latter by a channel nearly $1\frac{1}{2}$ miles wide ; they are $6\frac{1}{2}$ miles long N.E. by N. and S.W. by S., and $2\frac{1}{2}$ miles wide in the broadest part.

The depth of water varies irregularly from 2 to 18 feet, and the banks are everywhere intersected by tortuous lanes of deep water ; but no straight passage exists through them.

North Spit, the north extreme of Central banks has 6 feet over it, and lies S.W. by S. nearly 4 miles from Comboyuro point, and W. by N. $\frac{1}{2}$ N. $3\frac{1}{4}$ miles from Cowan Cowan lighthouse ; from it the east edge of the banks extends in a south-east direction upwards of 2 miles, till abreast Cowan Cowan point ; the eastern knoll, with 15 feet, bearing W.S.W. one mile from the lighthouse. A red buoy is moored in $3\frac{1}{2}$ fathoms near this spot, with Cowan Cowan lighthouse N.E. by E. $\frac{1}{4}$ E. $1\frac{1}{4}$ miles.

The south-east side of Central banks, is marked by two red buoys ; the easternmost is 3 miles S.W. $\frac{1}{2}$ S. from Cowan Cowan, and the second or south-west one (which has a red flag on it) lies S.W. $\frac{1}{4}$ S. 6 miles from the lighthouse ; they are each moored in 4 fathoms.

South-west Spit, the west extreme of Central banks, bears S.W. by W. 8 miles from Cowan Cowan lighthouse ; there are 5 feet on it, but the water deepens suddenly to 5 and 6 fathoms. The west edge of these banks from this spit runs N.E. by N. nearly straight for $6\frac{1}{2}$ miles to North spit, and forms the east boundary of Pearl channel. Southward of Central banks, the bottom changes to mud.

Mount Campbell just open east of Cowan Cowan point lighthouse N.E. $\frac{1}{2}$ N. (view E., plan No. 1,670*b*.) leads south-eastward of Central banks.

Tangalooma Road may be described as extending along the shore from Ship patch to the northward for the distance of a mile with anchorage in from 6 to 8 fathoms ; it is narrow, and in a measure protected from

strong westerly winds by Sholl bank, which runs parallel to the shore, and is very shallow. Tangalooma road is available for small vessels, and steamers of moderate draft; it affords the best protection from south-east gales along the west shore of Moreton island, and little tide is felt.

To enter with the deepest water, bring Ship patch to bear E. by N., in line with a conical sandy top just behind; run in on this bearing till within 2 cables of the beach, then anchor immediately, or keep a little northward till well within Sholl bank. The least water met with is 20 feet at low tide. Vessels drawing less than 8 feet may run out of this road to the northward in fine weather, by keeping close along the beach till past Sholl bank, but it is not recommended.

South Tangalooma Road, to the southward of Tangalooma point, affords anchorage in from 4 to 5 fathoms, sheltered from north-east winds, and protected westward by Dring bank; the latter is a mile long in a north and south direction, and separated at its northern end from Tangalooma point by a narrow passage with $2\frac{1}{2}$ fathoms water. This road is easy of access from the southward, but should not be entered without the chart.

Southward of Tangalooma point, the west coast of Moreton island, formed of moderately high sand cliffs and patches, is nearly straight, extending S.S.E. $\frac{1}{2}$ E. $10\frac{1}{2}$ miles to Sandy point, its south extreme. Two miles from Tangalooma this shore is fronted by an extensive sand-bank, partly dry at low-water springs, the edge of which runs to the southward at a varying distance from the shore till abreast Sandy point, where it extends 4 miles off. Shark spit, $2\frac{3}{4}$ miles South of Tangalooma point, projects three-quarters of a mile from the shore. This part of the bay should therefore be approached with great caution, as the edge of the bank is steep, and not always to be distinguished.

First hill in line with Tangalooma point N. $\frac{1}{2}$ W. (view A., plan No. 1,670b.), leads west of Shark spit.

Middle Banks.—The northern bank is 2 miles off shore, and nearly midway between Tangalooma point and Central banks. It has 13 feet over its shoalest part, just west of which a black buoy is moored in 14 feet, W. by S. $2\frac{1}{2}$ miles from Ship patch. The southern bank, with 15 feet over its shoalest part, bears S.W. $\frac{3}{4}$ W. $3\frac{1}{2}$ miles from Ship patch, and S. by W. $1\frac{1}{2}$ miles from the black buoy. The water deepens suddenly to the southward of Middle banks, and west of them the bottom changes to mud.

Cone hill in line with False patch N.E. $\frac{3}{4}$ E. (view D., plan No. 1,670b.) leads north-westward of Middle banks.

When south of these banks, Moreton bay for a breadth of 5 miles, except in the vicinity of Sandy point, is clear of hidden danger, and may

be traversed to within a mile of Red Cliff point on the western shore. The depth varies from 5 to 17 fathoms, deepest along the eastern side. The holding ground is good, and sea much more regular than among the shoals as the tides are weaker.

EAST CHANNEL branches to the southward from Main channel, east of Middle banks and west of Ridge shoal. It is 3 miles long North and South, and upwards of a mile wide. The depth from 4 to 12 fathoms, shoalest in the south entrance.

Cowan Cowan lighthouse or point in line with the shoulder of Howard range bearing N. $\frac{1}{2}$ E. (view C., plan No. 1,670*b*.), leads through the middle of East channel.

Ridge Shoal, forming the east boundary of East channel, is a narrow bank with from 2 to 6 feet over it; the direction North and South nearly straight for upwards of a mile. Its north extreme bears S.W. $\frac{3}{4}$ W., nearly one mile from Ship patch. Between Ridge shoal and the banks off Tangalooma point is a straight passage running nearly north and south, from 3 to 4 cables wide, having not less than 6 fathoms water in it; but a ridge of $3\frac{1}{4}$ fathoms joins the north end of Ridge shoal with Sholl bank.

Comboyuro point, just open west of Cowan Cowan lighthouse, on a N. $\frac{3}{4}$ W. bearing (view B., plan No. 1,670*b*.), leads through the centre of the above-mentioned passage.

PEARL CHANNEL leads southward from buoy B in Main channel through the centre of Moreton bay shoals to Brisbane road. It is bounded on the east by Salamander, Yule, and Central banks, and westward by Spitfire and Western banks. Its length is 13 miles in two reaches, the first or northern S. $\frac{1}{2}$ E. 6 miles, the southern S.W. by S. 7 miles. Its average breadth is nearly a mile, except near the entrances, which contract considerably. The depths vary from 4 to 12 fathoms. In the north entrance are some shoal knolls with 17 feet, which shift after heavy easterly gales; but with a few buoys to mark them, and one at the Elbow where the reaches meet, Pearl channel would be easy of navigation, as two courses S. $\frac{1}{2}$ E. and S.S.W. $\frac{3}{4}$ W. lead through the middle. The tide sets nearly direct through it, and is not so strong or irregular as in Main channel. See page 92.

Spitfire Banks, of irregular form, are nearly 2 miles long north-west and south-east, and upwards of a mile wide, with 11 to 18 feet over them. Their north extreme bears S.W. $\frac{3}{4}$ W. $1\frac{1}{2}$ miles from buoy B, and N.W. by W. $\frac{1}{2}$ W. 5 miles from Comboyuro point.

WESTERN BANKS form the main western boundary of Pearl channel, and extend from it to the west shores of Moreton bay. The north-east extreme, with 3 fathoms, bears W. by S. $\frac{1}{4}$ S. 4 miles from Comboyuro lighthouse. From it their eastern edge (mostly a narrow sand-

ridge, parts of which are nearly awash at low-water springs), trends S.S.E. 2 miles to the Elbow, when it runs S.W. by S. 7 miles to their south extreme. These banks, of a most complex character, are upwards of 40 square miles in extent, and 7 miles long in a north-east and south-west direction. There is deep water among them, but no passage through. In bad weather the sea breaks over their shoal parts.

Skirmish Banks, separated from the north part of Western banks by a narrow channel, are upwards of 3 miles long in a North and South direction, and from a quarter to half a mile wide, with as little as 6 feet over the shoalest parts. Their north extreme bears W. $\frac{1}{4}$ N. from Comboyuro point, and the banks front Skirmish point on Bribie island, being separated from it by a deep channel more than half a mile broad, through which the tide runs with considerable strength at springs.

Bribie Island, which forms the western side of the northern entrance to Moreton bay, is 18 miles long and about 4 miles wide at its broadest part, and is separated from the mainland by Pumice-stone strait. The eastern shore of the island, composed of sand ridges and stunted scrub from 10 to 25 feet high, trends with a slight curve inwards N.N.W. 17 miles from Skirmish point to the northern entrance of Pumice-stone strait, which is shallow, intricate, and fit only for boats in fine weather.

Caloundra Head, the north-west point of Moreton bay, is 170 feet high, and N.W. by W. $\frac{1}{2}$ W. $21\frac{1}{2}$ miles from cape Moreton. Half a mile East of the head is Bray rock, covered at high water.

PUMICE-STONE STRAIT, in the north-west part of Moreton bay, separates Bribie island from the main. Within its south entrance is the best sheltered anchorage in the bay, available at low-water springs for vessels drawing less than 13 feet.

The entrance to the strait may be considered as commencing at Skirmish point, the low south-east extreme of Bribie island, which bears W. by S. $\frac{1}{4}$ S. 8 miles from Comboyuro point. From Skirmish point the entrance takes a south-west direction along the Bribie island shore as far as South point, and round it up to Toorbul point on the main, following the trend of the island shore. The average width is from 3 to 4 cables, and the shoalest water, 14 feet, is met with at the entrance south of Skirmish point, forming a bar 2 cables wide from that point to Western banks. Inside this bar in mid-channel there is not less than 20 feet at low water for 5 miles up to the anchorage, which is just north of Toorbul point. Above Toorbul point the strait is shallow and filled with sand banks.

Toorbul Point, the west side of the south entrance of Pumice-stone strait, is of moderate elevation, rising from the beach to a plateau or level 60 feet above the sea, which stretches a considerable distance inland towards Glasshouse mountains. A large sand and mud flat, partly dry at

low-water springs, is formed around Toorbul point, and extends nearly 2 miles in a south-east direction to Western banks. The best anchorage is 2 cables north or north-west of the point, in from 4 to 5 fathoms, sand and mud.

Toorbul point is of sandstone formation, thickly wooded. A portion of the land is under cultivation, being the head-quarters of a large cattle station. The ridge or plateau from the point is of an average breadth of half a mile, and appears the best adapted spot for forming a settlement in this locality, as the land around is generally low and swampy.

Supplies.—Cattle are exported in considerable numbers to New Zealand, and an extensive timber trade is springing up. Fresh meat may sometimes be procured from the cattle station, prolific oyster beds are numerous in the strait, and fish abound all over the bay. Fresh water is plentiful on either shore, but it is of an indifferent quality, not to be compared with that at Moreton island.

DIRECTIONS.—Vessels entering Pumice-stone strait should keep north of Skirmish banks till within half a mile of the Bribie island shore, when they will be well inside them, after which steer for Skirmish point, rounding it $1\frac{1}{2}$ or 2 cables from the beach, but not more, so as to avoid the western banks. When past the bar keep close along the Bribie shore to the westward until abreast South point, which should be rounded with caution, as the channel there is narrow, and a shoal extends half a mile north-west of the point for some distance off shore. When past it, keep well over to the island shore, following the trend of the beach until Toorbul point bears W.S.W.; then steer W. by N., guarding against tide, and anchor where convenient in from 4 to 5 fathoms. A close attention to the lead and chart is necessary.

Sailing vessels should only enter with a good fair or leading wind, as the tide runs strong abreast Skirmish point, nearly $3\frac{1}{2}$ knots at springs. Small craft may beat out with the tide, but a boat should be ahead, to tow round if necessary.

TIDES.—It is high water, full and change, at Toorbul point, at 9h. 45m.; springs rise 6 to 8 feet.

Deception Bay lies South of Pumice-stone strait and Bribie island; it is of considerable extent, but so encumbered with shoals that only very small vessels can navigate it. The shores are low, skirted with mangroves, and mud-banks extend nearly a mile from them in all directions.

Caboolture creek or river, at the head of the bay, S.W. $\frac{3}{4}$ W. 7 miles from South point, can be entered by small vessels at high water, and may be navigated by them a considerable distance to the large sugar plantations established on the banks. The entrance to Caboolture creek is beacons, red on the starboard and black on the port hand.

Castlereagh Reef or Point, at the south-east part of Deception bay, lying S.S.W. $\frac{1}{2}$ W. 8 miles from Skirmish point, is low, rising gradually to an elevation of 30 or 40 feet. North reef, covering at two-thirds flood, extends three-quarters of a mile E.N.E. from this point, and the outer end is marked by a black and white iron beacon. Small vessels may find shelter from south-east gales in $1\frac{3}{4}$ and 2 fathoms, at a distance of $1\frac{1}{2}$ miles W.N.W. of Castlereagh point.

McConnel's house (a large white house at Sandgate) just open of Woody point S. by W. (view F., plan No. 670*b*.) clears the reefs off Castlereagh point.

From this point the coast extends South $2\frac{1}{2}$ miles to Red Cliff point (remarkable from its colour), and thence continues 2 miles further in the same direction to Woody point; fronted here and there by rocky ledges which only show at low water, and extend half a mile from Woody point.

BRISBANE ROAD extends from Woody point to Mud island, and is much exposed to north-east and easterly gales, which send in a heavy sea dangerous to small vessels. They are in a measure protected from south-easterly gales by Mud and St. Helena islands. Vessels may choose their anchorage anywhere between Mud island and Woody point, but the distance from the land must depend on their draught, as there is no greater depth than 4 fathoms at low water within three miles of the shore, except in the vicinity of Mud island.

Anchorage.—The most convenient anchorage for large vessels is in $4\frac{1}{2}$ and 5 fathoms off the river bar, with the centre of Mud island bearing E.S.E., and the light-ship in the river entrance bearing S. by W. The holding ground is mud, but large vessels as well as small craft have dragged considerably in heavy easterly gales.

Bramble Bay, comprising that portion of Brisbane road between Woody point and the entrance of Brisbane river, has less than 18 feet, and is only fit for small vessels to anchor with off-shore winds; its shores with the exception of Cabbage-tree head are low, with numerous mangrove swamps, and intersected by several shallow creeks, the principal one of which, named Pine river, bears S.W. by W., 2 miles from Woody point; it is navigable for a considerable distance by small steam-vessels and boats, and large quantities of wheat are grown on its banks.

Sandgate, a small village and watering place built on the summit of Cabbage-tree head, is conspicuous from the road by a large mansion; but the shore can only be approached at high water by boats, as a sand and mud flat dries off some distance.

Luggage or Uniacke Point, S.E. by S. $6\frac{1}{2}$ miles from Woody point, forms the west entrance of Brisbane river, and is a low wooded mangrove point, steep-to abreast; small craft may find good anchorage just inside it.

WEST or FRANCIS CHANNEL, the entrance to which lies S.E. $\frac{1}{4}$ S. from Woody point, has been cut through the Brisbane bar in a south-east direction, and carries a depth of $10\frac{1}{2}$ feet at low-water springs; it is well beacons and buoyed through its whole length, and 200 feet wide in the narrowest part. The buoys and beacons on the eastern side of the channel are black, and those on the western side red. The course through is very tortuous, and none but small short vessels should enter without a pilot, unless constantly running to the river.

LIGHTS.—(1.) A light-vessel painted red, with two masts, is moored inside the bar at the entrance of Brisbane river, $1\frac{1}{2}$ miles N. $\frac{1}{2}$ E. from Luggage point. It shows a *fixed* white light 34 feet high on the foremast: also day and night Tide signals indicating the depth over Brisbane bar.

(2.) From East beacon, 3 cables N.N.E. from the light-vessel, is shown a *fixed red* light; it is 22 feet high and painted white.

(3.) A *fixed green* light 10 feet above high water, from a screw pile light-house on the bank, $2\frac{1}{2}$ cables S.W. of the light-vessel.

(4.) From West beacon, three-quarters of a mile S. by E. from the light-vessel on the west side of the channel, is shown a *fixed* white light; the beacon is painted red.

(5.) At Lytton, two lights are shown, the northern *red* and the southern white.

Signals.*—The following are the Tidal signals in use on board the light-vessel, showing the depths on Brisbane bar, and in the cutting through the bar:—

			On bar.		In cutting.	
			ft.	in.	ft.	in.
Pendant at yard arm	-	-	4	6	11	0
Cone do.	-	-	5	0	11	6
Do. do. dipped	-	-	5	6	12	0
Ball do.	-	-	6	0	12	6
Do. do. dipped	-	-	6	6	13	0
Two balls vertical do.	-	-	7	0	13	6
Do. do. dipped	-	-	7	6	14	0
Ball over cone do.	-	-	8	0	14	6
Do. do. dipped	-	-	8	6	15	0
Cone over ball do.	-	-	9	0	15	6
Do. do. dipped	-	-	9	6	16	0
Ball at each yard arm	-	-	10	0	16	6
Do. do. dipped	-	-	10	6	17	0

* In consequence of a deposit of silt in the outer cutting, caused by recent floods, the available depth of water has decreased about one foot; the Tidal signals made from the light-vessel will therefore, until further notice, represent one foot less water in the cutting than that given in the accompanying table.—*Commander G. P. Heath, R.N., Portmaster, Brisbane, April 1875.*

		On bar.	In cutting.
		ft. in.	ft. in.
Cone at each yard arm	-	11 0	17 6
Do. do. dipped	-	11 6	18 0
Ball at one yard arm and cone at the other	-	12 0	18 6

The pendant and cones exhibited during flood tide will be red, and during the ebb tide blue.

At Night:—

		ft. in.	ft. in.
White light	-	4 6	11 0
Red light	-	5 0	11 6
Green light	-	5 6	12 0
Red over white	-	6 0	12 6
Red under white	-	6 6	13 0
Green over white	-	7 0	13 6
Green under white	-	7 6	14 0
Red over green	-	8 0	14 6
Red under green	-	8 6	15 0
Two red lights vertical	-	9 0	15 6
Two green lights vertical	-	9 6	16 0
Two red lights horizontal	-	10 0	16 6
Two green lights horizontal	-	10 6	17 0
Red and white horizontal	-	11 0	17 6
Green and white horizontal	-	11 6	18 0
Red and green horizontal	-	12 0	18 6

BRISBANE RIVER,* is half a mile wide at Uniacke point, Fisherman islands forming the east side; the navigation is intricate and should never be attempted by a stranger without a pilot. The lower part of the river, which lies between mangrove shores, till past Doughty creek, a distance of 6 miles, its breadth varying from $2\frac{1}{2}$ to 8 cables, is encumbered by numerous shoals and banks, through which cuttings have been made 200 feet in width, and maintained, when practicable, at a depth of $10\frac{1}{2}$ feet, so that vessels whose draft of water enables them to enter the river can reach the wharves of Brisbane, which have good accommodation alongside them. Above Doughty creek the river gradually narrows to from $2\frac{1}{2}$ to $1\frac{1}{2}$ cables, and the banks rise gently to detached wooded ridges and elevations, some reaching to a height of 200 feet, on which are erected villas. An iron bridge with swing openings spans the river above the wharves of the city, for vessels of light draught navigating the upper waters to Ipswich, (population 7,700), a distance of 50 miles.

* See Admiralty plan, Brisbane river, No. 1,674; scale, $\text{m} = 4$ inches.

It is contemplated deepening all the cuttings to 15 feet at low water.

The Bar in front of the river, formed of sand, mud, and shells, is nearly a mile in breadth, and has only 4 feet on it at low water.

Lytton, a small town on the eastern side of the river, near its entrance, is in communication with Brisbane by electric telegraph, and is a station for custom and health officers.

BRISBANE.—The city of Brisbane, situated on both banks of the river about 13 miles from the sea, is of considerable commercial importance, and the seat of government, as well as the metropolis of Queensland; the population, including the suburbs, is upwards of 30,000. In the year 1872 the value of the imports was 1,465,073*l.* and the exports 1,256,801*l.* Steam-vessels run almost daily between Brisbane and Sydney, and twice a week to Maryborough and Rockhampton; there is also monthly communication with India, China, and Europe.

Supplies.—Fresh provisions, coal, and firewood may be procured here, as well as salt meat, which is exported in considerable quantities. The best watering place, however, is in Yule road, which may indeed be considered the best on the coast.

Patent slip, Dock.—There is a patent slip in Shapston reach, on the east side of Kangaroo point, capable of hauling up small vessels, but it is not recommended to undertake extensive repairs unless absolutely necessary. The dry dock at South Brisbane is approaching completion; its length is 300 feet, and breadth upwards of 60 feet, with a depth over the sill of not less than 20 feet.

There are several foundries at Brisbane with capabilities for small repairs to machinery.

Gunpowder.—On the west bank abreast of Eagle Farm flats, and $2\frac{1}{2}$ miles above Lytton, is a powder magazine, which is not allowed to be kept in any quantity nearer to Brisbane.

A hulk, the *Proserpine*, is moored in the entrance of the river, 2 miles within the light-vessel; refractory seamen are here confined.

TIDES.—It is high water, full and change, on Brisbane bar at 10h. 5m.; springs rise 7 feet, neaps $5\frac{1}{2}$ feet: at the Quarry, at 10h. 30m.; springs rise $6\frac{3}{4}$ feet: and at Brisbane, at 11h. 0m.; springs rise $6\frac{1}{2}$ feet. See page 90.

The streams in the channel run from $1\frac{1}{2}$ to $2\frac{1}{2}$ knots.

Mud Island bears E. by S. $\frac{3}{4}$ S. $8\frac{1}{4}$ miles from Woody point, and S. by W. $\frac{1}{4}$ W. 13 miles from Cowan Cowan lighthouse; it forms the eastern limit of Brisbane road, and is upwards of a mile in extent, low, and covered with mangrove bushes; those in the central part being higher than the others. The island is surrounded by a mud-flat, drying out from a quarter to half a mile, its south end being marked by a red beacon. A

channel, three-quarters of a mile wide, exists between Mud island and Brisbane river bar.

St. Helena Island, the present penal establishment, bears S. $\frac{1}{2}$ W. $2\frac{1}{4}$ miles from the centre of Mud island; is fertile, and moderately high in its centre and south parts. It is $1\frac{1}{4}$ miles long, North and South, and three-quarters of a mile broad in its widest part, and surrounded by a mud-flat similar to Mud island. The channel between the two islands is a mile wide, marked by a black buoy and red and black beacon on the south, and a red beacon on the north side. A landing jetty projects from the south-west point of the island.

Amity Banks extend 7 miles W.S.W. from Amity point, Stradbroke island, and are from 2 to 4 miles wide. They dry in large patches at low-water springs, and are intersected in many places by deep gullies. Their western edge is steep, and bears S.E. $\frac{1}{2}$ S. 6 miles from the centre of Mud island. They are bounded on the north side by Rous channel, and that edge is well buoyed and beacons; no buoys mark their west side, but the south side is marked by two red buoys.

No good mark can be given to clear the west edge of Amity banks, and they should be approached with great caution, as the water shoals suddenly from 7 fathoms to 5 and 6 feet, and the ebb sets strong over them to the north-east.

Rainbow Reach separates Amity banks from Stradbroke island; it is narrow, and takes a serpentine course from Amity point to the southward, for 7 miles, towards Peel island. There is deep water through this reach to within a mile of its south entrance, where a bar stretches across with only 12 feet over it. The east side is bounded by a mud-flat, which dries at low water, and extends upwards of half a mile from Stradbroke island. Rainbow reach was formerly used by vessels entering Moreton bay through Rous channel, but is now only taken by vessels proceeding to the south parts of the bay.

Hope Banks bear S.S.E. $\frac{3}{4}$ E. 6 miles from Mud island, and are separated from Amity banks by a channel half a mile wide. They are somewhat less than a mile in extent, with 12 feet over their shoalest parts. Their south-west edge is marked by a red buoy moored in 4 fathoms.

Naval Reserve Bank bears S.W. 7 miles from Amity point. The bank is of small extent, with 11 feet over it, west of which a red buoy is placed in $4\frac{1}{2}$ fathoms, with Mud island bearing N.W. $\frac{1}{2}$ N. $8\frac{1}{4}$ miles. Between this bank and Amity banks is a narrow channel, with 5 fathoms through it, on the north side of which is placed a red buoy.

Peel Island (Turkroar), $10\frac{1}{2}$ miles S.E. $\frac{3}{4}$ S. from Mud island, is

the next feature worthy of notice, being midway between Stradbroke island and the main. It is slightly elevated, thickly wooded, and of oblong shape, 2 miles long, in an E.N.E. and W.S.W. direction, and a mile wide. A sand and mud flat, of irregular form, surrounds it, extending a considerable distance north and west from the island; its projecting edges are beacons and buoyed. On the banks south of Peel island are prolific beds of oysters.

QUARANTINE GROUND.—The station is on the south side of Peel island. Vessels performing quarantine usually anchor half a mile south-east of Peel island in 7 fathoms, with the houses at Dunwich about E.N.E. one mile. The sick are landed, and visited weekly by a surgeon appointed for that duty. The channel to the Quarantine ground, north of Peel island, is marked by beacons on the island shore, and red buoys to the eastward.

Dunwich, the former quarantine establishment, on a rocky head of Stradbroke island, 7 miles from Amity point, abreast Peel island, is now used as an asylum.

Bird Islands, two large mangrove islets, just above high water, and joined at low tides, bear S.W. by S. a mile from Dunwich. They are of small extent, and steep-to on the west side; but there is shoal water between them and Stradbroke island.

Canaipa Creek.—From Dunwich, the west shore of Stradbroke island, a wooded ridge of moderate elevation, extends S. by E. nearly straight for 7 miles to Canaipa creek, which latter is a shallow tortuous passage, separating the island from a group of smaller ones.

Moreton bay may be supposed to terminate here, as its head waters to Boat passage are little else than narrow, shoal, salt-water creeks and lagoons, encumbered with low mangrove islets and mud-flats.

Cleveland a small village on the west side of Moreton bay, abreast Peel island, and 10 miles S.S.E. from Mud island, is situated on a narrow tongue of low land, projecting North half a mile, and forming the east side of a shallow bay. A jetty extends eastward from the end of the point, but can only be approached by the smallest vessels, as the water shoals a considerable distance. Vessels may anchor a mile E.N.E. of the lighthouse on the end of the point, in 4 or 6 fathoms; but the anchorage is much exposed to north and south-east gales.

The west coast of Moreton bay, between Brisbane river and Cleveland is generally a low mangrove shore, drying out a considerable distance; it is much indented by shallow bays and creeks, only fit for boats. The country a short distance back is fertile, with sugar plantations.

Between Peel island flats and Cleveland the channel is $1\frac{1}{2}$ miles wide, with irregular soundings varying from $2\frac{1}{4}$ to 7 fathoms.

LIGHT.—From the lighthouse on the northern extremity of Cleveland point a *fixed* white light is exhibited at 38 feet above the sea, and visible 10 miles.

Beacons.—The channels at the south end of the bay, to Cleveland point, the Logan, Nerang creek, &c., are all marked with red and triangular beacons on the starboard, and black and square on the port hand when sailing towards Brisbane; but on entering any creeks or rivers that are beacons, the colour of the beacons is reversed—the red beacons being on the starboard hand going up the creek, and the black on the port hand.

Leading beacons for reaches, &c., are square or triangular, and usually painted white, except when black is easier seen.

Innes Island, on the west side of Moreton bay, and separated from the main by a narrow boat-passage, bears S.E. by S. $4\frac{1}{2}$ miles from Cleveland lighthouse; it is upwards of a mile in extent, wooded and slightly elevated. The water around the island is generally shoal, except to the southward, where there is a narrow passage with 16 and 18 feet.

The portion of Moreton bay between Innes island and the Stradbroke shore, although of considerable extent, is so encumbered with shoals that a description would only confuse, and the chart will be found the best guide.

South of Innes island the head waters of Moreton bay, to Logan river and Nerang creek, are only navigable for the smallest craft although the channels are well beacons throughout.

Natives.—The natives of Moreton bay have frequent communication with Europeans, and are harmless; they either speak or understand English fairly.

TIDES.—It is high water, full and change, at Comboyuro point, at 9h. 30m.; springs rise 4 to 7 feet. In Pumice-stone strait, at 9h. 45m.; springs rise 6 to 8 feet. Near the head of Moreton bay, among the islands, at 11h. 0m.; rise 6 feet. See page 87.

Strong south-easterly winds and calms cause the greatest rise; but during the prevalence of westerly winds in winter months it is often very slight. The tidal streams are strong and set obliquely across the channels, necessitating great caution.

In Main channel the flood sets S.S.W. over the banks, deflected more to the west as it approaches Moreton island; the strength from $1\frac{1}{2}$ to $2\frac{1}{2}$ knots. The general set of the flood in the bay is south, and ebb north but in some places the direction of the stream is varied by the shoals. Its strength is much less near the middle of the bay than along either shore.

In Harbour reach, the first of the ebb sets strong to the north-east over the banks; after half-tide it takes a more northerly direction, and later about North and N.N.W. The ebb sets E.N.E. along the shore, through Freeman channel, from 2 to 3 knots; and abreast Cowan Cowan point its

strength is from $2\frac{1}{2}$ to 3 knots. On the western shore close in, abreast Skirmish point, the flood sets in nearly $3\frac{1}{2}$ knots at springs.

The tide from the northward is felt through Moreton bay to within 10 miles of Boat passage, when the flood from that opening meets it.

Abreast Amity banks the ebb sets strong to the north-east through Rous channel.

The vicinity of shoal water throughout the bay is often indicated by tide ripples.

South of Middle and Western banks the tidal streams are weak, until south of Mud island.

Soundings.—On entering Main channel, between North and East banks, the soundings decrease gradually from 7 to 5 fathoms; and soon after rounding buoy B, on the north-west point of East banks, the depths increase to 9 and 13 fathoms in Harbour reach, and after passing Yule road there will not be less water until abreast Tangalooma point. Off Cowan Cowan point the depth increases from 15 to 23 fathoms.

In the middle of Moreton bay the bottom is generally mud, varying in depth from 5 to 17 fathoms; on approaching the shoals it shifts to sand, and well indicates their vicinity. Beyond Mud island, to the southward, in the channel towards Cleveland, the water shoals very gradually to 5 fathoms abreast the latter place. Beyond Cleveland and Peel island the bay becomes again encumbered with shoals, having no good channel through them.

DIRECTIONS.—For MAIN CHANNEL.—Vessels from the southward or eastward, entering Moreton bay by Main channel, should take a pilot, but in the event of not being able to obtain one, are recommended not to approach within a quarter of a mile of the buoy marking Smith rock; and to keep a good look-out from aloft. Mount Tempest kept open of cape Moreton, or at night, cape Moreton light, to the westward of S.S.W. $\frac{1}{2}$ W. will ensure being outside of the rock; and Ridge-tree hill seen over but not to the northward of North point leads one third of a mile to the southward of it. When approaching cape Moreton from the northward, mount Tempest should not be brought to the eastward of S. by E. until the north extreme of cape Moreton bears E.S.E., or, keep cape Moreton lighthouse well open eastward of the outer white patch, bearing S.E. by E. $\frac{1}{2}$ E. In the absence of Smith rock buoy, or in thick weather, a vessel from the southward should, according to the wind, hug the foot of the cape, which is bold-to, or borrow upon the breakers on Flinders reef, rather than attempt the midway track of this passage.

Having passed Smith rock, and being about a mile northward of North point, steer W. by N. until the lighthouses on Comboyuro and Cowan Cowan points come in line, bearing S. by E., and cape Moreton lighthouse

comes on, or just open south of the outer white patch over North point, bearing E.S.E.; the vessel will then be abreast and 2 cables north of Fairway buoy. The Glass-house mountains will be seen in clear weather, with the highest (Beerwah) bearing nearly West, but it is too distant to be used as a leading mark.

From the above position make a S.W. $\frac{1}{2}$ W. course, passing close north of the buoys A and B, which mark the northern edge and north-west spit of East banks.

When rounding buoy B, steer S.E. $\frac{1}{2}$ S. for mount Tempest, if it can be distinguished. It will be well open south of Comboyuro point and the cottages at the pilot station. This course will take a vessel clear of Salamander bank, passing 2 cables east of the red buoy marking its eastern edge, and on to Yule road, close west of the black buoy at the south extreme of Hixson bank. The narrowest part of the channel between Hixson and Salamander banks is upwards of half a mile wide, and the banks are plainly discernible from a slightly elevated position.

In Harbour reach the tide streams should be carefully guarded against, as they run strong at springs, and set obliquely across it. See page 90.

There is good anchorage in $4\frac{1}{2}$ and 4 fathoms west and south-west of buoy B at the entrance of Pearl channel, if wind or tide fail, or in the event of the vessel reaching thus far before dark, as in the latter case it would not be prudent to proceed beyond without a pilot.

With the ebb stream, and wind to the southward of east, it is not possible to beat through Harbour reach, and with the flood a vessel should be careful to avoid being set on to Salamander bank, as the tide runs strong over it. In this contingency, were the Pearl channel buoyed, a vessel would gain time by going through it, which might be done without a tack; and a saving in distance of at least 2 miles effected to Brisbane road.

Pearl Channel.—With the present chart, however, a skilful mariner could navigate through Pearl channel, in fine clear weather, by keeping well over on its eastern side, taking care when approaching North spit of Central banks to ascertain his position in time, so as to alter course to S.S.W. $\frac{1}{4}$ W. through the southern reach, the sides of which are clearly defined. See page 81.

Howe Channel.—A vessel may in fine weather, when abreast of Fairway buoy, enter the bay by Howe channel, should it be desired to do so. Immediately after passing Fairway buoy, the summit of Tangalooma point will be seen in line with Cowan Cowan lighthouse, bearing S. by E. $\frac{1}{2}$ E.; a vessel should then haul to the southward, and steer through Howe channel into Harbour reach with the above mark on; when nearing the black buoy at west entrance of Middle channel the summit should be opened westward of the lighthouse, to clear Venus bank. See page 77.

At Night.—Vessels approaching Moreton bay from the northward, and entering by Howe channel—with fine weather and smooth water—should, after making the fixed white light on Comboyuro point, be careful not to enter the red sector of Yellow-patch light, until Comboyuro point light is obscured on a S. by E. $\frac{1}{2}$ E. bearing.

On Comboyuro point light being obscured, haul gradually to the southward, enter the red sector of Yellow-patch light, and on opening out Comboyuro point light, steer for it keeping on the edge of the white light. When Yellow-patch light comes nearly in line with cape Moreton light, edge to the westward and open out the fixed white light on Cowan Cowan point, which, bearing S. by E. $\frac{1}{4}$ E., leads westward of Venus bank.

Leaving Moreton bay at night, by Howe channel, after passing the line of leading lights for Middle channel, keep on the eastern edge of Comboyuro point light, until Yellow-patch light changes from white to red, the vessel will then be in a position north-westward of the Fairway buoy, and may at once steer seaward.

Attention to these directions will take a vessel through Howe channel in not less than 16 feet at low water ; by similarly keeping the eastern edge of Cowan Cowan point light just open, the least water will be 19 feet. Cowan Cowan point light, however, being more distant, is not as good a guide as Comboyuro point light.

Middle Channel.—Vessels not drawing more than 15 feet may, with a fair wind, after closely rounding North point of cape Moreton, pass over East banks through this channel, by keeping cape Moreton and Yellow-patch lighthouses in line, bearing E. $\frac{1}{4}$ S., until the black buoy at the south side of west entrance to Middle channel is passed and Ship patch is opened out westward of Cowan Cowan point, then proceed towards Yule road, passing east of the Hixson bank buoy.

Even with a fair wind vessels drawing as much as 13 feet should not attempt to enter Middle channel without a pilot. See page 77.

By Night.—After rounding North point and sighting the *red* light on Comboyuro point, steer for the latter until Yellow-patch and cape Moreton lights are in line E. $\frac{1}{4}$ S., when the vessel should steer W. $\frac{1}{4}$ N., keeping the lights in line until the *red* light on Comboyuro is obscured, and again opened out as a *white* light on a S.S.E. bearing, after which haul up, and making due allowance for the tide, steer for Cowan Cowan light which, kept in sight, clears the western edge of Venus bank.

These directions will lead over East bank, and to the northward of the knoll, in 3 fathoms at low water.

Freeman Channel.—During strong easterly and south-easterly winds when in Middle channel, a short breaking sea runs, which is at times nearly abeam and liable to break on board vessels entering, Freeman

channel may be taken by small vessels and coasting steamers acquainted with the locality, passing about half a cable southward of the two red buoys on the north side of the channel. The depth in the channel, which at present is 10 feet, is kept posted at the port office, and any change will be duly notified.

Small craft entering by Freeman channel in fine weather can have no better guide than when nearing it to keep from $1\frac{1}{2}$ to 2 cables off the beach till abreast Comboyuro point, which may be rounded within a quarter of a mile, and a vessel may steer for Yule road.

The eye from aloft is at all times a good guide for this as well as other channels; the banks being formed of white sand, the deeper water is distinctly visible.

From Comboyuro Point.—Comboyuro point being bold to approach, a large vessel may pass within a quarter of a mile of the beach, and continue through Main channel for about one mile close along shore to the southward, until the west extreme of the trees on the point bears North, when she may anchor in 6 to 12 fathoms, in Yule road. Or, if proceeding to Brisbane road, a S. $\frac{1}{4}$ E. course should then be shaped, passing at about one third of a mile from Cowan Cowan point. As buoys mark Main channel, between Central and Middle banks, a direct S.W. by S. course may be made for Brisbane bar, passing in 15 to 6 fathoms south-eastward of Central bank buoys, at the distance of one third and two thirds of a mile respectively, and at one third of a mile north-westward of Middle banks buoy. Continue the same course 9 miles from Middle banks buoy, and anchor in $4\frac{1}{2}$ fathoms, mud and sand, in Brisbane road, off the river bar, the highest trees on Mud island bearing E.S.E., and the light-vessel (painted red) in the river entrance S. by W.

When the buoys cannot be seen, it may sometimes be desirable to continue near Moreton island, past Middle banks, through East channel. In which case, from Cowan Cowan point steer South till the lighthouse on that point comes in line with the north shoulder of Howard range N. $\frac{1}{4}$ E. when run with that mark till a mile past Tangalooma point, or Ship patch bears N.E. $\frac{1}{2}$ N.; then proceed S.W. $\frac{1}{2}$ W. for Brisbane road and anchor as just directed. In passing Mud island do not approach nearer than a mile.

In beating through Main channel, when south of Cowan Cowan light-house, the views D and E on plan No. 1,670*b* would be of use as turning marks, when approaching Middle and Central banks, especially if the buoys are gone, or not seen.

At night Cowan Cowan light showing *white* between the bearings of N.E. $\frac{1}{4}$ N. and N.N.E. leads through Main channel; and showing *red* between N. by E. $\frac{1}{4}$ E. and N. $\frac{1}{2}$ E. leads through East channel.

North Channel.—When entering Moreton bay by this channel, vessels should keep a mile off Caloundra head to clear Bray rock, and when past this danger steer about S.S.W. for 2 miles, until well inside of Hamilton patches, and about three-quarters of a mile from the shore of Bribie island; the chart, and a good look-out from aloft, will then be the best guide to lead up to either Pearl or Main channels, taking care to guard against the flood tide which sets strong towards Western banks. *See page 76.*

DIRECTIONS for BRISBANE RIVER.—To cross Brisbane bar, keep mount Gravatt on, with a small dip in the near bushes westward of the entrance of the river, until mount Cotton is seen westward of East beacon, when haul up for mount Cotton, keeping that hill between West and East beacons, which marks will clear the banks on either side.

At Night.—Keep the light on West beacon open westward of the *red* light on East beacon—this light should not be opened more than a quarter of the distance between the *red* light and the light-vessel—and pass East beacon at the distance of half a cable. It need hardly be noticed that no stranger should attempt the bar without a pilot.

To enter the River by the Cutting.—Instead of crossing the bar by the above directions, when the vessel approaches the three-fathoms line, steer about West for nearly one mile, and round the outer black beacon, which is in 11 feet at low water. Steer so as to leave the black beacons to the eastward at a distance of 100 feet.* There is a depth of 10 feet 6 inches at low water in the outer cutting. At the second elbow in the channel keep over towards the red triangular beacon, and when that is passed, gradually haul over again for the black beacons on the port hand, and hauling up to the south-east, enter the inner cutting, in which there is also a depth of 10 feet 6 inches at low-water springs, at a distance of 100 feet from the beacons. The red triangular beacons on the starboard hand show the eastern edge of the channel. When the light-vessel is reached and the last red buoy passed, a vessel will be in the main channel of the river, and must haul to the southward so as to pass eastward of West beacon.

At Night.—Vessels intending to enter the cutting at night should, while outside the bar, run to the westward until the *green* light on West banks is in a line with West beacon *red* light, bearing about S.E. by S. These lights should be kept in line until abreast the outer beacon of

* See foot note, page 85.

the cutting, when the line of beacons should be kept close aboard on the port hand, as in daylight, until the main channel of the river is reached near the light-vessel.

Caution.—Strangers are cautioned that with the ebb tide the stream sets obliquely across either end of the cutting near the light-vessel, and across the channel and cutting lying beyond the outer triangular red beacon, while the flood tide sets across both cuttings.

Masters of vessels are cautioned against anchoring in or near the edge of any of the cuttings in the river.

From Mud Island, bound to Cleveland, after passing that island not nearer than a mile, steer S. $\frac{1}{2}$ E., keeping the centre of the island bearing N.N.W. until abreast Hope banks buoy; pass a short distance west of the latter; then alter course to S.S.E. $\frac{1}{2}$ E., till Cleveland light-house bears S.W. by W. or W.S.W. distant one mile, when anchor as convenient in $4\frac{1}{2}$ or 5 fathoms, with the south point of Peel island bearing E. by S.

Proceeding to the Quarantine ground, after passing Hope banks, haul up E.S.E. for the north-east point of Peel island, keeping the houses at Dunwich just open of the point. This course will take a vessel up to the red buoy off Naval Reserve bank, which ought to be passed close on the port hand; then steer East until abreast the beacon on the north spit of Peel island flats; round it at a distance of 2 cables, and alter course to S.E. by E. $\frac{1}{2}$ E. for a red buoy that will be seen ahead $1\frac{1}{2}$ miles off, and nearly in line with the houses at Dunwich. On approaching this buoy, or when midway between it and a beacon on the north-east point of Peel island, haul up S.S.E. for the quarantine ground, one mile distant, passing close west of a second red buoy which marks the outer extreme of the bank off Dunwich. Anchor where convenient in from 5 to 8 fathoms, midway between Bird and Peel islands; or with Dunwich bearing N.E. by E. just open north of Bird island.

Beyond Dunwich and Peel island local knowledge and the chart are better guides than any written directions.

The Glass-houses are three peaks near each other, rising abruptly from an extensive low plain, and remarkable for their singular resemblance to glass furnaces. Beerwah, the northernmost, 1,760 feet high, is visible from a distance of 45 to 60 miles. They bear W.N.W. distant respectively, 17, 19, and $20\frac{1}{2}$ miles, from Skirmish point.

The country about the Glass-houses and Pumice-stone strait is low, and either sandy or rocky, with a slight superficial vegetable soil, yet not ill-clothed with wood and grass.

The COAST from Moreton bay to Sandy cape,* between latitude $27^{\circ} 2' S.$ and $24^{\circ} 41' S.$, is generally low with short stretches of sandy beach and bare rocky heads as far as Low bluff at Laguna bay, with a well-wooded back country, rising gradually to the flat-top Blackall range from 1,200 to 1,600 feet above the sea: Coolum and Nindery hills, with mount Wensley and Christina peak being conspicuous landmarks, thence to Sandy cape one long and almost unbroken beach, backed by ranges of sand-hills in many parts entirely bare of vegetation.

Soundings.—A flat of very even soundings of from 20 to 30 fathoms extends from about 3 to 20 miles from the shore, except near Sandy cape where it projects about 10 miles, deepening suddenly and rapidly on approaching the 100 fathoms line. This peculiarity in the depths renders it dangerous to close the land by the lead, and at night or in thick weather the water should not be shoaled under 100 fathoms, which, east of Sandy cape, is 11 miles from the shore.

Cartwright Point, 140 feet high, is N. by W. $\frac{1}{4}$ W. $7\frac{1}{2}$ miles from Caloundra head, with low land between; Moolooloo river, with a fairly sheltered entrance, may usually be entered by small craft with little difficulty, it runs into the bight immediately westward of the point. Timber cut from the neighbourhood is embarked here. Raper shoal of 2 fathoms, which breaks, lies 3 miles North of Caloundra head and one mile from the shore, Coolum hill in line with Cartwright point, bearing N.W. by N. (view A., chart No. 1,068), leads a mile eastward. Gneering shoal is N. by E. $\frac{3}{4}$ E $2\frac{1}{2}$ miles from Cartwright point, the depth on the shoal is $4\frac{1}{4}$ fathoms and the sea breaks upon it in bad weather; the summit of Large sand patch in line with Low bluff N. by W. $\frac{3}{4}$ W. (view B., chart No. 1,068), leads one mile east, and Caloundra head just open of Cartwright point S. by E. $\frac{1}{4}$ E. leads between the shoal and the land.

Maroochy River, 3 miles N.W. by W. from Cartwright point, can be used by small craft only in very fine weather, as the sea breaks on the bar heavily; Mudjimba island 100 feet high is near the shore, $1\frac{1}{2}$ miles North of the river's mouth.

Jew Rock, of $3\frac{3}{4}$ fathoms and small in extent, with 10 to 11 fathoms close round, lies N.N.W. $1\frac{1}{4}$ miles from the eastern extreme of Low bluff and breaks only in bad weather; mount Isabel in line with Laguna hillock, S.W. by W. $\frac{1}{2}$ W. (view C., chart No. 1,068), leads northward, and Coolum hill in line with the southern part of Low bluff, bearing South (view D., chart No. 1,068), leads eastward of the rock.

Low Bluff, a bold rocky headland, N. by W. $\frac{1}{4}$ W. 26 miles from

* See Admiralty chart, Australia, east coast, sheet X., with views, No. 1,068; scale, $m = 0.3$ of an inch.

Caloundra head is the northern termination of a ridge of sand-hills partially covered with scrub, rising from a sandy shore. A double wooded summit rises from the bluff to an elevation of 470 feet.

Laguna Bay, north-westward of Low bluff, has depths of from 5 to 10 fathoms, and affords shelter from south and south-east gales. Noosa river, which flows into the southern part of the bay, has a shifting bar entrance with only 3 feet water on it. There is a considerable traffic with the Gympie goldfields, 46 miles distant, and a large quantity of timber is sent to Brisbane. It connects a chain of shallow lagoons nearly parallel with the coast, and drains the low swampy valley running northward to the head of the southern creek of Great Sandy strait.

The best anchorage in Laguna bay is in from 6 to 9 fathoms, with the extreme of Low bluff bearing E.S.E. distant $1\frac{1}{2}$ miles, and the entrance of Noosa river S.W. by S. Vessels should be prepared to leave on a shift of wind to E.S.E.

The **COAST** between Laguna bay and Double Island point is nearly straight, and rises abruptly to a ridge of sand hills partly covered with stunted trees. Large sand-patch is 6 miles northward of Low bluff.

From Double Island point a sandy beach extends north-westward to Inskip point, to which the ridge of sand-hills gradually descends.

Double Island Point, North 27 miles from Low bluff, is a steep rocky head 300 feet high, at the extremity of a neck of land running out about 2 miles from the mainland, with two hummocks on it; they have the appearance of two small islands, when seen from the southward. Double Island point may also be known by the reddish-white sandy cliffs in Wide bay.

Small vessels may find safe anchorage inside the point, sheltered from all but north-easterly gales, and out of the influence of the tide streams.

Wolf Rock above water, is $1\frac{1}{2}$ miles N. by E. of Double Island point; there is a passage between, with from 7 to 10 fathoms in it.

WIDE BAY is about 10 miles across from Double Island point to the south-east bend of Great Sandy island, and from 3 to 4 miles in depth. With the wind southward of S.E. there is good anchorage in Wide bay, in from 4 to 6 fathoms, with Double Island point bearing about E. by N., but there is no shelter with onshore gales. Vessels should be prepared to weigh or slip if bad weather sets in with a falling barometer, especially during the winter months, when the wind, commencing from the south-east, draws to the eastward as the gale increases.*

* During the survey in 1869, the surveying schooner rode out in safety, on more than one occasion, gales blowing from E.S.E. to E.N.E. with Double Island point bearing E. by N., and although a high sea rolled in the strain on the cables was not great.

WIDE BAY HARBOUR,* at the southern entrance of Great Sandy strait, is difficult of access in consequence of a dangerous bar across the entrance, at about $2\frac{1}{2}$ miles from the shore. The entrance to the harbour, which is 10 miles north-westward of Double Island point, is a deep channel, a little more than half a mile wide, between two dangerous spits extending to the eastward from Hook point (the south-east extreme of Great Sandy island) and Inskip point. The south spit, off Inskip point, is about $1\frac{1}{2}$ miles long and is always breaking.

The Bar has from 2 to $2\frac{1}{2}$ fathoms water on its deepest part, and is in general easily distinguished by heavy breakers, or in calm weather, when the sea is smooth, by the green colour of the water. Though the general character and formation of the bar remain the same, it has for several years past been undergoing a series of changes.

With strong south-east or easterly winds the sea breaks heavily upon the bar, rendering it unsafe to cross; and this is particularly the case in summer, especially in the months of February, March, and April, when the wind nearly always blows from south-east, and eastward. A vessel would have notice of the state of the bar by the swell on the coast before reaching Moreton island, when she might anchor under the lee of Double Island point, and there wait for a favourable opportunity to cross the bar, or, if considered desirable, run round Breaksea spit and proceed to Maryborough by the northern entrance from Hervey bay. If the swell is not great, the bar is safe to enter, though breaking across; the break is much less towards high water.

Inside, the harbour branches off into two arms, one trending to the southward, and the other to the northward, between Great Sandy island and the mainland. When once inside, secure anchorage about a mile in width, may be found for a large number of vessels, from abreast Inskip point up the north-west arm for more than six miles, in from 4 to 10 fathoms water, and it is one of the most commodious and sheltered ports on this part of the coast. The most convenient berth is along the eastern shore abreast the observation spot.

Tin Can Creek, the southern arm, extends from Inskip point in a southerly direction for nearly 13 miles, with low mangrove shores and mud flats on either side, terminating in a swamp. There are from 2 to 6 fathoms water up the centre of the creek for 10 miles, but a bar with only $2\frac{1}{2}$ fathoms on it lies across the entrance. Cedar and pine trees are cut in the neighbourhood and shipped here.

Vessels awaiting the tide, or for a favourable opportunity to cross the

* See Admiralty plan, Southern entrance to Great Sandy strait, No. 1,080; scale, $m = 1.4$ inches.

bar, anchor off the entrance of the creek in $4\frac{1}{2}$ to 5 fathoms water, at about 3 cables West of Inskip point.

The Pilot, for Great Sandy strait, is stationed at Inskip point; vessels are not boarded outside the bar.

Natives.—Some of the men about Hook point, who wear copper badges, are good pilots for the south portion of Great Sandy strait. They must be watched, as they are great thieves.

Signal Station.—At Inskip point there is a telegraph and signal station.

TIDES.—It is high water, full and change, at Hook point, at 8h. 30m.; springs rise 6 feet. The tidal streams at the entrance of Wide Bay harbour, run from 2 to 3 knots, and the ebb sets strongly over the outer banks.

DIRECTIONS.*—Vessels bound for Wide Bay harbour from the southward, having made Double Island point, should pass eastward of Wolf rock and steer N.W. by N. for about 5 miles, when the entrance into the harbour will be seen, it is marked by two large white, and two large black, square beacons on Hook point. Do not approach the heads nearer than 4 miles, until the beacons are clearly seen and nearly in line, as the shoal water of the bar extends eastward for nearly $2\frac{1}{2}$ miles, and generally shows by the break, or discoloration of the water; but when it cannot be distinctly seen, a vessel will be outside, while a remarkable sand-patch, near the top of the range on Great Sandy island, is kept open east of a hill to the southward. Cross the bar with the white and black (square) beacons in line, bearing W. $\frac{1}{2}$ S., which will lead over in not less than 15 feet, and pass southward of the red buoy about half a mile east of Hook point. On Inskip point are two square white beacons; these beacons in line bearing S.W. $\frac{1}{2}$ W. will lead through and clear of the spit off Hook point. When across the bar the red buoy off Hook point should be steered for, taking care to pass a little eastward of it before altering course to the westward for the anchorage.

The beacons are altered to meet the changes on the bar. The white beacons are always made out better from daylight until 3 p.m., and the black beacons later in the day. Strangers should take a pilot if possible.

Caution.—In leaving Wide Bay harbour a vessel should not attempt to proceed to sea if there is any break across the bar, as it is attended with great risk and danger, from the high rollers, which break heavily upon the bar.

GREAT SANDY STRAIT, of which Wide bay forms the southern entrance, separates Great Sandy island from the mainland; it is

* Middle and North channels are reported closed, 1879. Leading lights are exhibited from the square beacons on Inskip and Hook points. Two red and white triangular beacons in line bearing W. $\frac{1}{2}$ N. (S.E. extreme of Hook point) to be used by small vessels only.

40 miles long and from $1\frac{1}{2}$ to 8 miles wide, the eastern shore of the strait being formed by the southern portion of the western coast of the island, between Hook and Sandy points.

East Shore.—From Hook point the east shore of the strait trends westward and north-westward 4 miles to Elbow point, and then N.N.W. $\frac{1}{2}$ W. $3\frac{1}{2}$ miles to Snout point, and is low and wooded. From Snout point to Stewart island, the shore is low, irregular, and broken, consisting of narrow sand, mud, and mangrove flats, from which it rises quickly to wooded sand-hills 180 to 300 feet high; beyond Stewart island it takes a winding and general N. by W. direction, 25 miles, to Sandy point, at the east side of the north entrance. See page 103.

West Shore.—A low mangrove shore fronted by extensive shoals which cover at half tide, and numerous detached high-water islands in the northern part, forms the western side of Great Sandy strait, trending northward, and nearly parallel with the opposite shore, as far north as Shoulder point 22 miles from Elbow point, where it takes a sharp turn of 3 miles westward to the mouth of Mary river, and again trends to the northward 9 miles to Dayman point, becoming somewhat higher and thickly wooded a short distance back. See page 104.

Wood and Water are abundant; the most convenient watering places are at the south end of Great Sandy island nearly midway between Hook and Elbow points, and from a running stream which flows over the beach just northward of the white cliffs off the entrance of Mary river; also at the South white cliffs.

The SOUTH ENTRANCE of Great Sandy strait is navigable from side to side, with from 10 fathoms, between the heads, to 7 fathoms 7 miles up, in a north-west direction. Further progress is then impeded by shallow flats, of from $1\frac{1}{2}$ to 2 fathoms at low water, after which a narrow and intricate channel trends to the northward, along the east shore, to abreast of the entrance of Mary river, passing between the western side of Great Sandy island and extensive shoals, with numerous mangrove islands on them, stretching nearly across from the west side of the strait to the island. The eastern side of the channel is marked by red beacons and buoys, there are also three white beacons, and the western side by black beacons and buoys; the banks forming the channel are steep to.

DIRECTIONS.—Entering Great Sandy strait from the southward, after passing the heads of Wide Bay harbour steer for about $2\frac{1}{2}$ miles along the shore of Great Sandy island, at the distance of two cables until abreast of the first high land, then N.W. $\frac{1}{2}$ W. for the Fairway buoy, which pass on either side and haul up North, or for the most elevated part of the ridge of high land on Great Sandy island.

A large white beacon will be seen ahead, on the eastern side of the channel, and the first black beacon, on the western side; pass between these, and about a cable from the first red beacon on the east side. The channel beyond this is marked by seven black beacons on the edge of the western bank; when abreast the sixth beacon a vessel will be about one quarter of a mile from the red buoy on the end of a spit stretching southward from Stewart island. Leave the red buoy on the starboard hand, and a large white beacon, on the western bank, on the port hand, and passing between a red beacon on the right and two black beacons on the left, steer to the northward for a large white and a red beacon which will be seen near together. After passing the white beacon, and two red ones on the same side, the next beacon will be black, followed by a black buoy, also on the west bank. About one-third of a mile northward of the black buoy is a green buoy marking a rocky patch, of not more than 6 feet at low water, lying immediately westward of it and in the narrowest part of the channel through Great Sandy strait.

At this point, the tides from Wide bay on the south and Hervey bay on the north, meet and separate, and the rise at springs is about 11 feet. Tide scales are placed on the west bank—one about $1\frac{1}{2}$ miles southward of Stewart island, and another about 2 miles south-westward of south White cliffs—showing the depth of water which will be found in the shallowest parts of the channel between.

Pass a short distance eastward of the green buoy, and, leaving a black beacon on the left, and three red ones on the right, pass close to a black buoy near a black beacon beyond; after passing this beacon a black beacon will be seen, about 2 miles off, in line with some low sandy cliffs on Great Sandy island, and a black buoy, marking the eastern extreme of the west bank, still farther on. From this black beacon, which is abreast South White cliffs, the channel follows the low mangrove fronted shore of Great Sandy island, as far as a low point from which the coast trends north-eastward towards the white cliffs opposite Mary river. From the low point steer about N. by W. $\frac{1}{2}$ W. for a dip in the land at the north-west end of Woody island; this course will lead eastward of the black Fairway buoy, from which the entrance to Mary river lies in a W.S.W. direction, distant $2\frac{1}{2}$ miles.

MARY RIVER empties itself into the western side of Great Sandy strait, about 27 miles from the southern entrance at Wide bay, and 15 miles from the northern entrance, abreast Sandy point. The river is navigable by vessels of moderate draft to the town of Maryborough, and the channel is well beacons and buoyed, the red beacons being round, and the black beacons square. As in Great Sandy strait, the beacons and buoys colored red, are to be left on the starboard hand in entering, and

those coloured black, on the port hand. Considerable dredging operations are in hand, by which the navigation of the river will be greatly improved.

Strangers should not enter or navigate Mary river without a pilot. It is also advisable to obtain a pilot when navigating Great Sandy strait.

TIDES.—It is high water, full and change, at Mary river heads, at 9h. 30m.; springs rise from 8 to 10 feet. At the town of Maryborough it is high water about noon. The flood stream through Great Sandy strait from the southward meets that from Hervey bay to the northward, near Round bush. Springs run from 2 to 3 knots, the tides being generally very irregular. See pages 102 and 106.

Maryborough,* on the north bank of Mary river, about 15 miles from its mouth, is the principal town of Wide bay and Burnett districts, with a population of 8,608.† Fresh and salt provisions may be procured; there are also two foundries where small repairs, castings, &c. can be made to machinery. The chief exports from Maryborough are gold, copper, sugar, and timber for building purposes. There is weekly steam communication with Brisbane. In 1872 the value of exports and imports amounted together to 383,826*l*.

The NORTHERN ENTRANCE‡ to Great Sandy strait from Hervey bay may be said to commence at a line extending from Arch cliff, on Great Sandy, island, W. by S. $\frac{1}{2}$ S. 28 miles to Burrum point on the mainland, the depth across varying from 9 to 5 fathoms, sand over mud. No vessel should go within 2 miles of this line without a pilot, the whole space to Woody island being full of sand-banks, with shallow water and blind channels between them, into which a vessel might run and find herself surrounded by breakers, which happened to a vessel in 1870.

Both the mainland and Great Sandy island being thickly wooded, and without any decided feature, makes it difficult to fix a vessel's position by compass bearings, the white Arch cliff on Great Sandy island and Woody island to the southward, being the only conspicuous objects, and in hazy weather the lead is the best guide, for neither Woody island nor the lighthouses are very plainly seen until near Fairway buoy, which lies at

* In consequence of the erroneous impression likely to be conveyed to masters and owners of vessels from the name Wide bay being constantly associated with that of Maryborough, the latter port will in future be styled Maryborough, Hervey bay, and not Maryborough, Wide bay; because strangers bound to Maryborough, instead of entering Wide bay, pass round Breaksea spit, 90 miles northward.—Port Office, Brisbane, October 4th, 1862.

† "Australasia," A. R. Wallace, 1879.

‡ See Admiralty plan, Northern entrance to Great Sandy strait, No. 1,081; scale, $\text{m} = 1\cdot4$ inches.

the entrance of Ship channel, North 6 miles from Vernon point, and nearly a mile outside Pearl bank.

Vernon Point, a prominent projection of the mainland, W. by N. $\frac{1}{2}$ S. 9 miles from Sandy point, and the north-west termination of the strait, does not appear like a point when approaching it from the northward, until well into the channel between the banks, the point bearing W. by S. Vernon point differs from the adjacent coast, from its not being wooded to the water's edge, and the grass having a yellowish green colour, with a clump of trees on the highest part, showing above the others. There is free-stone fit for building purposes at the point, and at the back of it is a swamp, with fresh water.

From Vernon point the coast, which forms a bight, trends E.S.E. 5 miles to Dayman point; it is thickly wooded and is bordered by a sandy beach, off which the water is very shallow.

The entrance of Mary river lies South, 9 miles from Dayman point; the low intermediate coast being lined with mangroves and fronted by extensive sand and mud-flats, towards Woody island, without a boat passage at low-water.

The East side of Great Sandy strait from Sandy point recedes 3 miles to the eastward, forming a deep bight, which dries at low water and leaves an extensive bank of muddy sand. The coast then trends nearly South 10 miles, and is bordered with mangroves, and several creeks of fresh water, from which thickly wooded land rises to an elevation of 150 or 200 feet.

The coast next continues southward 2 miles to the White cliffs opposite Mary river, and off these cliffs is Tyroom road, at present the anchorage for large vessels. This is the most convenient place for watering and cutting wood, and natives are always encamped in the locality, who will readily cut wood and carry water in return for food and tobacco.

Woody Island, of which the north-west point lies E.N.E. 2 miles from Dayman point, is $4\frac{1}{2}$ miles long, N.W. and S.E., and one mile broad near the centre, where it rises to the height of 200 feet above high water. This island has a very fertile aspect, with grassy slopes descending from its thickly wooded summit.

Little Woody Island lies midway between the south-east end of Woody island and Great Sandy island: it is about half a mile in extent, thickly wooded, and when seen from a little within Fairway buoy, appears as a small round lump.

Duck Islets, which are two in number, and 30 feet high, lie between a half and $1\frac{1}{2}$ miles off the south-east point of Woody island.

Pearl bank is the northern termination of Dayman spit, which extends off from Dayman and Vernon points to within half a mile of the Fairway buoy, with depths varying from one to $2\frac{3}{4}$ fathoms.

Ship Channel, the principal northern channel into Great Sandy strait, which leads south-eastward between Woody island and Sandy point, is bounded to the eastward by Fork and Sandy point banks, and Little Woody island ; and to the westward by Pearl, Middle, and Long Middle banks. The channel is marked by black buoys to the eastward and red buoys to the westward. From just within Fairway buoy the least depth of water in the channel is 18 feet, and the average breadth from a half to three-quarters of a mile. There is no navigable channel on the west side of Woody Island.

Round Islet, which has a few bushes on it, lies midway between Dayman point and the north-west extreme of Woody island ; it is only a few feet above high water, and at low water is connected with Woody island by a muddy sand-bank.

The Outer Banks, in fine weather, may be distinctly seen by the colour of the water, and in bad weather, by the breakers on them. They are very dangerous, and lives have been lost from boats' crews of vessels wrecked on or near Breaksea spit finding themselves among the breakers, when running for Maryborough during the night.

Caution.—Allowance must be made for the tidal streams ; when the islands, buoys, and beacons are seen in daylight, there is little difficulty, by the help of the chart and attention to the lead, in entering the strait with a fair wind. Great caution, however, must be observed during the rainy season, from December to May ; the sands often alter in shape and extent, the buoys frequently drift, and are seldom replaced in the same positions.

LIGHTS.—Two *fixed* lights are shown from two hexagonal white towers, each 34 feet high, on Woody island, in the northern part of Great Sandy strait. North bluff light, 130 feet above the sea, about four tenths of a mile from the north extreme of the island, and 100 yards within the high-water line, shows white, except when bearing between S.W. $\frac{3}{4}$ W. and W. $\frac{1}{4}$ S., when it shows *red*. Middle bluff light, on the summit of the island abreast Middle bluff, is elevated 215 feet, and shows white, except between the bearings of S. $\frac{1}{4}$ E. and S.S.W. $\frac{1}{4}$ W. where it is *red*. Between the bearings of N.N.W. $\frac{1}{4}$ W. and N. by W. $\frac{1}{4}$ W. the light is obscured. The lights bear from each other S.E. $\frac{1}{4}$ E. and N.W. $\frac{1}{4}$ W. distant nearly 2 miles ; North bluff being visible 16 miles, and Middle bluff 19 miles.

The lights in line lead over Pearl bank in 12 to 13 feet, and south-west of Middle bank. The lighthouses are connected with each other and with the town of Maryborough by electric telegraph.

points open of the north point of Woody island, when, making due allowance for tide, steer E.S.E., northward of the red buoy on the extreme of Long Middle bank; thence proceed with Leading hill just open east of Little Woody island until the high lighthouse bears S.W., then haul up and pass half a mile westward of Little Woody island. From abreast Little Woody island steer to pass within a quarter of a mile of the easternmost Duck islet, and keep Little Woody island open of Duck islets until a red beacon is passed on the starboard hand. When Baupal mountain is seen over a dip in the trees on South head of Mary river, steer on this mark until North head bears W.S.W., and a red buoy and beacon have been left to the northward, when pass northward of the midway buoy and proceed into Mary river, or for the anchorage in Tyroom road off White cliffs, which is of considerable extent and affords good anchorage in from 5 to 11 fathoms, sand, over a space of 3 miles between Great Sandy island and the opposite shoals. The best anchorage for large vessels is off the south part of the cliffs in 6 or 7 fathoms, with the west extreme of Little Woody island open east of Duck islets bearing N. $\frac{1}{4}$ W.

By Night.—Entering Great Sandy strait by night, westward of Middle bank, steer so as to pass one or two miles west of Fairway buoy, until the two lights on Woody island are visible and are brought in line bearing S.E. $\frac{1}{4}$ E.; steer with the two lights in one past Dayman spit and Middle bank, until the lights are nearly on the same level, then look out for the red buoy, which is placed a short distance south-westward of the line of the lights: on sighting the buoy steer about E. $\frac{3}{4}$ S. (making due allowance for tide) for the red buoy off the north end of Long Middle bank. Should the low or north light be the first to appear *red*, keep upon the edge of the *red* light until the high light also is *red*; but if the high light is the first to appear *red*, steer southward until the low light is also *red*. When the lights are seen to become *red* at the same time, a vessel is about one third the distance from Long Middle bank across the channel; then steer about S.E. $\frac{1}{4}$ E., and open the *white* lights, when, if the low light shows as a *white* light first, the vessel will be to the westward of the course, and to the eastward if the upper light becomes *white* first. From thence steer to pass Little Woody and Duck islands, keeping Little Woody island open of the latter until the high light is obscured, when the vessel will be abreast the red beacon, she may then steer S.S.W. $\frac{1}{4}$ W. until the light again opens out as a *white* light, when she will be abreast the red buoy opposite the white cliffs, from which a course must be gradually shaped for the river heads.

In entering with the two lights in line, should the red buoy which denotes the turning point, by any accident not be seen, the vessel may still with safety stand on with the lights in line until the high light is dipped below the northern hill.

TIDES.—It is high water, full and change, at the northern entrance of Great Sandy strait, at 9h. 14m. ; springs rise 10 feet, neaps 7 feet. The tidal streams run about 40 minutes after high and low water, by the shore ; the strength of the flood will be accelerated by strong northerly winds, and checked by strong south-easterly winds, but the ebb does not appear to be influenced by the winds. Both the flood and ebb streams in the channels take the direction of the deepest water, except near the edges of the banks where they invariably set right over the shoals. See page 103.

Pilots.—A pilot can be obtained from the pilot vessel stationed at the northern entrance of the strait.

The principal signal station is near the low lighthouse at the north end of Woody island.

DIRECTIONS for the Northern entrance of Great Sandy strait.—Although the following directions may be of use to masters of vessels acquainted with the locality, they are quite unintelligible to a stranger, without a chart, showing the various channels, buoys, and beacons referred to.

A vessel bound to Maryborough having entered Hervey bay with a fair wind, should not approach the entrance of Great Sandy strait nearer than into 9 fathoms during the night, as in 6 fathoms she will be within a mile of the breakers. Having shoaled to 9 fathoms, a vessel should anchor, and wait for daylight ; the bottom is sandy with mud underneath.

In fine weather a vessel may stand off and on, keeping the lead going ; it seldom blows hard from the North, and with any other wind there is never so much sea as to injure a well found vessel. In the event of its coming on to blow hard from the northward, and there is no pilot on board, it will be best to stand over to that side of Hervey bay which affords most shelter, and anchor. Strong northerly winds generally haul to the eastward, and shelter will then be found on the Great Sandy island side in Platypus bay. The west side of the bay does not afford such good anchorage, on account of the sands which extend from the shore.

No vessel until her position is clearly ascertained, should shoal the water to less than 9 fathoms when standing towards the outer banks. When Woody island is distinguished, bring the two hummocks on the island, just touching, keeping the higher of the two to the eastward, which will lead near to Fairway buoy which is black with a black flag. From Fairway buoy steer about S.E. by E. $\frac{1}{4}$ E., and leave a red buoy, on a 15 feet patch, on the star-board hand, and a black buoy, off the elbow of Fork bank, on the port hand. Immediately the black buoy is passed, bring Leading hill (a small peak, formed by a clump of trees, on the high land of Great Sandy island) open west of Little Woody island, and continue on this mark, passing a red buoy off the east extreme of Middle bank, until Dayman point is about two

points open of the north point of Woody island, when, making due allowance for tide, steer E.S.E., northward of the red buoy on the extreme of Long Middle bank; thence proceed with Leading hill just open east of Little Woody island until the high lighthouse bears S.W., then haul up and pass half a mile westward of Little Woody island. From abreast Little Woody island steer to pass within a quarter of a mile of the easternmost Duck islet, and keep Little Woody island open of Duck islets until a red beacon is passed on the starboard hand. When Baupal mountain is seen over a dip in the trees on South head of Mary river, steer on this mark until North head bears W.S.W., and a red buoy and beacon have been left to the northward, when pass northward of the midway buoy and proceed into Mary river, or for the anchorage in Tyroom road off White cliffs, which is of considerable extent and affords good anchorage in from 5 to 11 fathoms, sand, over a space of 3 miles between Great Sandy island and the opposite shoals. The best anchorage for large vessels is off the south part of the cliffs in 6 or 7 fathoms, with the west extreme of Little Woody island open east of Duck islets bearing N. $\frac{1}{2}$ W.

By Night.—Entering Great Sandy strait by night, westward of Middle bank, steer so as to pass one or two miles west of Fairway buoy, until the two lights on Woody island are visible and are brought in line bearing S.E. $\frac{1}{2}$ E.; steer with the two lights in one past Dayman spit and Middle bank, until the lights are nearly on the same level, then look out for the red buoy, which is placed a short distance south-westward of the line of the lights: on sighting the buoy steer about E. $\frac{3}{4}$ S. (making due allowance for tide) for the red buoy off the north end of Long Middle bank. Should the low or north light be the first to appear *red*, keep upon the edge of the *red* light until the high light also is *red*; but if the high light is the first to appear *red*, steer southward until the low light is also *red*. When the lights are seen to become *red* at the same time, a vessel is about one third the distance from Long Middle bank across the channel; then steer about S.E. $\frac{1}{4}$ E., and open the *white* lights, when, if the low light shows as a *white* light first, the vessel will be to the westward of the course, and to the eastward if the upper light becomes *white* first. From thence steer to pass Little Woody and Duck islands, keeping Little Woody island open of the latter until the high light is obscured, when the vessel will be abreast the red beacon, she may then steer S.S.W. $\frac{1}{4}$ W. until the light again opens out as a *white* light, when she will be abreast the red buoy opposite the white cliffs, from which a course must be gradually shaped for the river heads.

In entering with the two lights in line, should the red buoy which denotes the turning point, by any accident not be seen, the vessel may still with safety stand on with the lights in line until the high light is dipped below the northern hill.

There is good anchorage for small craft inside Long Middle bank, under a sandy point about a mile to the southward of Middle bluff. While running down between the island and the bank, the island shore abreast North bluff should not be approached within half a mile, nor abreast Middle bluff within a quarter of a mile.

GREAT SANDY ISLAND—Fraser island—is 68 miles long North and South, and 13 miles broad, near its central part. It consists of a continuous range of barren sand-hills, in some parts 700 to 800 feet high, with occasional large sand cliffs, and some stunted trees facing the sea. The east coast of the island from Hook point is an unbroken sandy beach extending about N. $\frac{3}{4}$ E. 50 miles, to Indian head.

PLATYPUS BAY.—From Sandy point the beach trends about N.E. by N. for 20 miles into the depth of Platypus bay, thence north-west for 12 miles to Rooney point which bears from Sandy point N. $\frac{1}{2}$ E. 25 miles. The shore of the bay is composed of a sandy beach, rising to wooded and moderately high land, with fresh water lagoons in the northern part. The most remarkable features in the bay are Arch and Triangle cliffs, the former 10 miles and the latter 16 miles from Sandy point; some streams of fresh water are found between these two cliffs, the bare summit of Station hill may also be easily made out on a near approach.

The depths, except in the southern part of the bay which is somewhat shoaler, vary from 7 to 11 fathoms, sand, with stiff blue mud underneath. The bay affords good anchorage, and shelter with winds from S.S.W. round by east to North, but with onshore winds there is a short sea. Some shelter may be obtained from N.W. winds by anchoring midway between Station hill and Rooney point at about two thirds of a mile off-shore.

Wood and Water can be procured between Arch and Triangle cliffs with offshore winds, when the landing is easy.

The natives are addicted to thieving, and are a turbulent, strong, and well-made race; around Sandy cape they are reported to be very treacherous and cannibals.

Rooney Point.—From Rooney point, the north horn of Platypus bay, the shore trends 11 miles in a north-easterly direction towards Sandy cape, bending to the eastward as the cape is approached.

Ferguson Spit, with 6 feet to $3\frac{1}{2}$ fathoms, extends N.W. by N. $3\frac{1}{2}$ miles from Rooney point; its edges are marked by tide ripples. Sandy cape lighthouse in line with white patch, bearing E.N.E. (view F., chart No. 345), leads a mile northward. Vessels drawing less than 10 feet, may, in smooth water, cross Ferguson spit, with the light bearing N.E. by E.

Indian Head, North 56 miles from Double Island point, is a steep bluff promontory, forming the eastern point of Great Sandy island; and,

when seen from northward or southward, makes like an island. The land from which the head projects is 600 feet above the sea, and the most elevated part of the northern portion of the island. Waddy point, much resembling Indian head, bears N.N.W. about 3 miles from the head. From Waddy point the shore trends westward and northward 17 miles to Sandy cape, forming a bay, off which good anchorage will be found with off-shore winds from South to N.W., in 8 to 10 fathoms, from one to 3 miles off shore. Small vessels may anchor closer in.

Gardner Banks lie eastward of Indian head, the southern bank is E. by S. 11 miles, and North Gardner N.E. $\frac{3}{4}$ E. 10 miles from the head the least water over each of the banks is 13 feet.

SANDY CAPE, the north extreme of Great Sandy island, is a prominent head-land and a remarkable feature of this coast, affording an excellent mark for vessels passing by the Inner route for Torres strait, the navigation of which may be said to commence on rounding Breaksea spit, a shoal extending 17 miles from the cape. The cape is a low, rounding, sandy point, with irregular sand-hills, (scantly covered with vegetation) which from their white and cliff-like appearance, can be seen 24 miles to seaward. The summit of the most conspicuous of these hills is a bare sand-hill 280 feet high; some stunted trees on this range, which is the highest for several miles round, are 390 feet above the level of the sea.

LIGHT.—Upon the summit immediately southward of the bare sand-hill within the extreme of Sandy cape, is a white iron tower 99 feet high, from which is exhibited, 400 feet above the sea, a white light, *revolving very two minutes* and visible 27 miles. Approaching from the southward, the light becomes visible on opening Indian head, bearing N.W. $\frac{3}{4}$ N.; and it is seen over Hervey bay to within 4 or 5 miles of Fairway buoy of Ship channel.

The light will be visible on the horizon at the following distances, namely:—

With the eye above sea level.	Distance.	With the light dipping on a S. by E. bearing, a vessel will be distant from the extremity of the spit.
10 feet.	26 $\frac{1}{2}$ miles.	7 $\frac{1}{2}$ miles.
15 "	27 $\frac{1}{4}$ "	8 $\frac{1}{4}$ "
20 "	28 "	9 "
30 "	29 $\frac{1}{4}$ "	10 $\frac{1}{4}$ "
40 "	30 $\frac{1}{4}$ "	11 $\frac{1}{4}$ "
50 "	31 "	12 "

In certain conditions of the atmosphere, it is possible that these distances may occasionally be increased by refraction.

Water and Wood.—Good fresh water may be procured by digging wells a few feet deep, in a thickly vegetated valley westward of

the lighthouse. There are also some large pools of good water, close to high-water mark, at about 2 miles south-westward of the former watering place; off either of which a vessel may anchor in 4 or 5 fathoms, sandy bottom, within half a mile of the shore. Wood may also be procured near the watering places. Platypus bay, however, will probably be found the most convenient place.

Anchorage.—Good anchorage will be found when the wind is from E.N.E. to South, with the lighthouse bearing E.S.E., at a distance of one third of a mile to one mile from the beach, in 4 to 6 fathoms, sandy bottom, but good holding ground.

Vessels intending to anchor under the cape should not bring the lighthouse to bear to the southward of S.E.; or when off Rooney point, to the northward of E.N.E.

Surf.—A cautious landing or embarkation is necessary, as a heavy surf breaks occasionally on the beach.

Sandy Cape Shoal is a detached coralline knoll of 9 feet which breaks in bad weather, lying $2\frac{1}{2}$ miles eastward of the eastern elbow of Breaksea spit, and N.N.E. $7\frac{1}{2}$ miles from the extreme of the cape; from it the lighthouse bears S.S.W. $\frac{3}{4}$ W. $10\frac{1}{2}$ miles. Bare hill, 5 miles South of the cape, open southward of the bush on Bush patch bearing S.S.W. (view D., chart No. 345), leads $1\frac{1}{4}$ miles eastward; and the same hill open westward of the bush, S. by W., leads one mile westward of the shoal.

When a vessel is on the line shown on the chart as leading to the westward of the shoal, the relative positions of the Bush and Bare hill will be just the reverse of those for leading to the eastward, as shown in the above view. Care should be taken not to bring the marks for leading westward of the shoal on, until the vessel is about 4 miles northward of Sandy cape, as within that distance they lead close to the outer edge of Breaksea spit.

To ensure passing outside by night, the soundings should not be decreased to less than 35 fathoms on approaching the latitude of the shoal— $24^{\circ} 35' S$.

Caution.—Except in case of absolute necessity, vessels should pass to the eastward of Sandy cape shoal.

BREAKSEA SPIT is a dangerous shoal on which the sea generally breaks heavily, extending N.N.W. 17 miles from the extreme of Sandy cape, and N. by W. 19 miles from the lighthouse; the greater portion consists of dead coral and sand-banks with some narrow intricate channels between them. A heavy overfall is at times experienced close to the spit end. The spit should not be approached to the southward of lat. $24^{\circ} 22' S$.

The east side of Breaksea spit is steep-to, there being from 4 to 9 fathoms at the distance of one mile from the edge of the breakers.

The spit should be approached with great caution on all sides, especially by sailing vessels if the wind be light, as the tidal streams set strong over it; its edge is not well defined, and the soundings are irregular. Two patches of 5 and 4 fathoms lie West $7\frac{1}{2}$ miles, and W.S.W. 6 miles from the north extreme of the spit; these patches require further examination and may have less water over them.

Long Shoal, on the western side of Breaksea spit, is $1\frac{1}{2}$ miles long, with a depth of $2\frac{1}{4}$ fathoms over its shoalest part at the north-east end, which lies N. by W. $\frac{3}{4}$ W. $13\frac{1}{2}$ miles from Sandy cape lighthouse; the shoal extends N.E. and S.W., and breaks in bad weather. A spit of 4 fathoms stretches northward for one mile, and south-westward for 3 miles.

Porpoise Shoal, a patch of 3 fathoms, is N.W. $\frac{1}{2}$ N., $6\frac{1}{4}$ miles from the lighthouse, and from it the extreme of Sandy cape bears E. by S. $\frac{3}{4}$ S. 7 miles.

DIRECTIONS.—Vessels going round Breaksea spit to Sandy cape, must be careful not to go into less than 7 fathoms; and when working up to the cape, the lighthouse should not be brought to the southward of S.E. $\frac{1}{2}$ E., to clear Long and Porpoise shoals.

By day the sand-hills at Sandy cape should be dipped below the horizon before rounding Breaksea spit (view E., chart No. 345), while at night a vessel should not be kept away for rounding its northern extremity until the light begins to dip below the horizon. See p. 109. This position of the light should be retained until the necessary change of bearing shows that the danger is past.

In rainy or squally weather, when the light on Sandy cape may be obscured, vessels should not attempt to make the light from the northward, but should endeavour to pick it up when bearing to the eastward of S.E. or to the westward of S.W.

A good departure can be obtained for vessels taking the Capricorn channel by observing the bearing of the light when it begins to dip below the horizon.

TIDES.—It is high water, full and change, at Sandy cape, at 8h. 50m.; springs rise 6 to 8 feet. The flood and ebb streams are regular, and set across Breaksea spit, and along the northern shore of Great Sandy island about S.W. and N.E. from one to 2 knots an hour.

Current.—Eastward of Great Sandy island the current runs from one to 2 knots an hour about, S.S.E.

CHAPTER III.

SANDY CAPE TO CAPE GLOUCESTER, THE GREAT BARRIER REEFS,
AND INNER ROUTE.*

VARIATION IN 1879.

Sandy cape	-	-	9° 5' E.	Percy islands	-	8° 00' E.
Port Curtis	-	-	8° 30' E.	Cape Gloucester	-	7° 20' E.

Decreasing about 1' annually.

HERVEY BAY,† on the western side of Sandy cape, is about 80 miles broad E. by S. and W. by N., and 50 miles deep. Its eastern shore is formed by that part of the coast of Great Sandy island, already described, extending from the cape to Sandy point. The western shore, consisting of rocky points and sandy bays, extends in a north-westerly direction 35 miles from Dayman point, in the bight of the bay, to Sloping hummock, a hill near a projecting part of the coast; thence the western shore of the bay still continues to trend north-westward 50 miles to Round-hill head, the western extremity of Hervey bay.

Low land extends several miles from the coast, and is tolerably clothed with wood and grass; it then rises to hills of considerable elevation amongst which Double Sloping hill (view B., chart No. 345) is the most remarkable.

Over the greater portion of Hervey bay depths of from 7 to 17 fathoms will be found, with the exception of a space about $1\frac{1}{2}$ miles in extent, of from 22 to 25 fathoms, W.S.W. 18 miles from Rooney point. The southern part of the bay is encumbered with the sands and shoals lying off the northern entrance of Great Sandy strait, extending in an irregular curve for about 8 miles from Sandy and Dayman points. See page 103.

TIDES.—It is high water, full and change, at the head of Hervey bay at 9h. 14m., springs rise 10 feet. The tidal streams run about north and south from one to $1\frac{1}{2}$ knots an hour.

* This chapter was revised and corrected in March 1878 by Staff Commander Bedwell, in charge of Admiralty survey, Queensland.

† See Admiralty charts, Australia, east coast, sheet X., No. 1,068; scale, $m = 0.3$ of an inch: also sheet XI., with plans and views, No. 345; scale, $m = 0.25$ of an inch.

DIRECTIONS.—In proceeding into Hervey bay round Breaksea spit, the latter should not be approached within the depth of 7 fathoms ; and when working up towards Sandy cape, westward of the spit, the lighthouse should not be brought to bear southward of S E. $\frac{1}{2}$ E., to clear Long and Porpoise shoals.

As the prevailing winds are from south-east during nine months in the year, generally blowing from about south in the morning, and veering to south-east later in the day ; a vessel working up Hervey bay from Bunker group or port Curtis, should endeavour to be near the middle of the bay in the evening. Should a vessel in a north-west wind, with a low barometer, be southward of Sloping hummock at dark, it would be prudent to work to windward under easy sail. But if the wind is from east to south, or from the westward, proceed up in 10, 8, and 7 fathoms, keeping within 8 miles of the western shore, and anchor until daylight, in 7 or 8 fathoms, with Woody island lights bearing about S.E. by E. ; or proceed into Great Sandy strait as directed on page 106.

Burrum River, falls into Hervey bay 16 miles westward of Dayman point, and is navigable for small vessels drawing less than 6 feet water ; the mouth of the river is easily discernible, by its forming a well-defined opening in the shore. Burrum point, the north head of the river, shows as a long thickly-wooded point, just visible from Fairway buoy of Ship channel into Great Sandy strait. On approaching the bar which extends about 2 miles off the entrance, the water gradually shoals from 7 to 2 fathoms ; the passage across is marked by a large black beacon, and the depth varies from one to 3 feet at low water. Within the bar is Five-fathom hole, affording safe anchorage in all weather. Coal mines are worked on Burrum river about 20 miles from the sea.

Sloping Hummock, a conspicuous solitary wooded hill 350 feet high, is $2\frac{1}{2}$ miles inland, and W. by S. $\frac{1}{2}$ S. 44 miles from Sandy cape.

BURNETT RIVER* empties itself into the sea on the west side of Hervey bay, 5 miles N.N.W. of Sloping hummock, and can be easily distinguished by the lighthouse and houses at the pilot station, situated near the South head. The river is the outlet for considerable mining and other produce ; and is navigable for vessels of light draft for about 10 miles to Harriet island, (page 115,) situated immediately above the township of Bundaberg. Navigation ceases here except for boats. The average breadth of the river is about 2 cables.

The Bar, at the eastern entrance of Burnett river, has depths over it of 4 and 5 feet at low-water ordinary springs, and, unless there has been a continuance of heavy easterly weather, seldom breaks ; the narrowest part of the bar is about one cable across, and marked by

* See Admiralty plan :—Burnett river, No. 412 ; scale, $m = 3$ inches.

a large black buoy, the water deepening quickly on either side. Two large white beacons on the south side of the river, kept in line bearing S.W. by W. lead over the bar in the deepest water, (passing near a red and a black buoy moored in 5 feet water on the bar,) and clear the end of the spit on the northern side; which having been passed, the leading marks in the bend of Sea reach may be steered for. When over the bar, vessels may anchor south of Clark point in 15 to 18 feet.

LIGHTS.—From a lighthouse painted white, on the South head of Burnett river, a *fixed* white light is shown, at an elevation of 33 feet above high water, visible seaward between the bearings of S.E. by E. and N.W. by W., and is seen from a distance of 10 miles.

There are also two leading lights exhibited from the beacons for crossing the bar.

Pilot.—A pilot is stationed at the entrance of the river.

Signals.—On arrival of vessels off the mouth of Burnett river, the following signals, showing the depth of water over the bar, are exhibited from the flagstaff at South head:—

	ft. in.		ft. in.
Ball north yard-arm	- 6 0	Ball above flag north, ball south	
Ball south yard-arm	- 6 6	yard-arm	- 12 0
Flag north yard-arm	- 7 0	Ball above flag south, ball north	
Flag south yard-arm	- 7 6	yard-arm	- 12 6
Ball north and south yard-arms	- 8 0	Flag above ball north, ball south	
Flag north and south yard-arms	- 8 6	yard-arm	- 13 0
Two balls north yard-arm	- 9 0	Flag above ball south, ball north	
Two balls south yard-arm	- 9 6	yard-arm	- 13 6
Ball above flag north yard-arm	- 10 0	Two balls north, flag south yard-	
Ball above flag south yard-arm	- 10 6	arm	- 14 0
Flag above ball north yard-arm	- 11 0	Two balls south, flag north yard-	
Flag above ball south yard-arm	- 11 6	arm	- 14 6
			and up- wards.

At Night:—

	ft. in.		ft. in.
Red light	- 6 0	Two green lights, vertical	- 10 6
Green light	- 6 6	Two red lights, horizontal	- 11 0
Red light over white	- 7 0	Two green lights, horizontal	- 11 6
Red light under white	- 7 6	White light north, red south	- 12 0
Green light over white	- 8 0	Red light north, white south	- 12 6
Green light under white	- 8 6	White light north, green south	- 13 0
Red light over green	- 9 0	Green light north, white south	- 13 6
Red light under green	- 9 6	Red light north, green south	- 14 0
Two red lights, vertical	- 10 0	Green light north, red south	- 14 6

The western mouth of Burnett river, 4 miles W. by N. from the main entrance, is full of shoals and sand-banks, with not more than 2 feet on them in some places. The sea breaks very heavily here in bad weather.

Bundaberg.—The township of Bundaberg, on the south side of the river, is 9 miles from the entrance. The government wharf is on this

side of the river, and has 13 feet alongside at low water. The river bank here is a steep clay cliff, with a depth alongside of from 18 to 20 feet, almost touching the rocks, and forming a natural wharf. This feature is common to many other parts of the river. Opposite the township is a saw-mill and wharf, the latter having a depth of 14 feet close to.

Steam-vessels, to and from Brisbane, call once a week at Bundaberg.

Harriet Island, 10 miles from the sea, is low and sandy. The passage north of it is dry at low water near the east end, and not more than 2 feet can be depended on in the south channel. A mile beyond Harriet island are several low rocks in the bed of the river.

DIRECTIONS.—Vessels from the southward bound for Burnett river, after passing Sloping hummock, should not approach the coast nearer than a mile until the flagstaff at the pilot station bears W.S.W., when they should anchor or lay to outside until the pilot comes on board. Strangers should not attempt to enter without a pilot.

Vessels from the northward, in order to avoid the banks outside Burnett river, which seldom break, must not approach the coast nearer than 3 miles, and attend to the lead until South head light bears W.S.W.

None but small vessels should attempt to enter or leave Burnett river unless with a fair or leading wind and favourable tide ; the best time is near the top of high water.

TIDES.—It is high water, full and change, in Burnett river, at 9h. 30m., springs rise 8 to 9 feet, neaps range 3 to 4 feet. The highest and lowest tides are with south-east winds and calms; north-west and west winds diminish the range considerably. The tidal streams at the entrance run from 2 to 3 knots; higher up, the ebb is stronger. After freshets in the river, the flood is not felt above the mouth.

The COAST, from Sandy cape to Keppel isle, between latitude $24^{\circ} 41'$ S. and $23^{\circ} 10'$ S., bends sharply back to the north-westward from Great Sandy island, and includes the important harbour of port Curtis, and Fitzroy river. Off this portion of the shores of Australia, commences the Great Barrier reef, forming and protecting the Inner passage to Torres strait; leaving between its southern extreme and Breaksea spit, Curtis channel.

Baffle Creek, lies N.W. by W. 20 miles from the west entrance of Burnett river; Kolan river and Litabella creek are nearly equidistant between. The coast consists of a low sandy ridge covered with stunted wood; patches of $4\frac{1}{2}$ and 5 fathoms will be found 2 to 4 miles from the shore. Across the entrance of Baffle creek is a bar of from one to 2 feet at low-

water springs; the creek is accessible only to small vessels drawing about 7 feet, which ascend to the large boiling-down establishment about 7 miles from the sea. The trade having almost ceased, the pilot has been removed to port Curtis. The channel at the entrance is liable to constant change.

Vessels bound to Baffle creek from the eastward, after rounding Breaksea spit, should make the land about 20 miles southward of Round hill head, and in proceeding to the southward, should keep the beach well on board, until near the northern point of the creek.

Standing in for the bar, the two white leading beacons must be kept in line, bearing S.W. by S., until within a ship's length of the south head.

From Baffle creek the sandy coast ridge continues north-westward 6 miles to Blackwater creek, whence the land rises in height to Toowong hill, 4 miles northward of the creek.

Anchorage.—Good anchorage, with off-shore winds, will be found in 5 or 6 fathoms, sand, about $1\frac{1}{2}$ miles off the entrance, with Double Sloping hill bearing S. by W. $\frac{1}{2}$ W. ; from this position two white leading beacons should be seen.

Round Hill Head, the north-west extreme of Hervey bay, 165 feet high, forms the south-east point of Bustard bay, and is the bluff termination of hills, well covered with wood and grass, sloping down to the northward from Round hill, which is 900 feet high.

Round Hill Creek, is a shallow inlet to the westward of Round hill head, full of sand-banks, and nearly dry at low-water spring tides. The entrance to the creek is half a mile S.W. of Round hill head ; and the channel about 150 feet wide, with 2 feet water on the bar at low spring tides ; the channel is constantly shifting.

Eurimbula Creek, from which a considerable quantity of timber is shipped in small craft, is 3 miles S.W. by W. from Round hill head. There are from 2 to 3 feet on the bar at low-water springs, but the channel is liable to constant change.

Approaching the creek, steer for the north head until the two white leading beacons on the south head are in line, bearing about S.E. by S. ; cross the bar with the beacons in line and up to the south head which is steep-to, passing on the port hand a black beacon on the end of the sand-spit projecting north-westward from the head. After passing a red beacon on the south-east extremity of a sand-flat extending from the north shore, follow the southern shore for a quarter of a mile, to the wharf at the saw-mill.

Bustard Bay, between Round hill and Bustard heads, is not of sufficient depth to afford shelter except from winds off the land. There is,

however, shelter for small vessels during south-easterly winds, in $2\frac{1}{2}$ or 3 fathoms, between Round hill head and Eurimbula creek.

BUSTARD HEAD, N.W. $\frac{1}{2}$ W. 10 miles from Round hill head, is a double flat-top point of moderate height; detached rocks extend $2\frac{1}{2}$ miles northward from the head.

Tidal Streams.—Off Bustard head the flood stream runs to the north-westward and the ebb to the south-eastward.

Outer Rock, 2 feet above high water, lies N. $\frac{1}{2}$ E. nearly $2\frac{1}{2}$ miles from Bustard head, and is steep-to. The Outer rock is marked by a *red* sector from Bustard head light. Middle rocks are two patches awash at high water N. by E. $1\frac{1}{4}$ miles from the head. Inner rock is 2 cables off and also awash at high water.

Between Outer and Middle rocks there is a passage half a mile wide of from 13 to 16 fathoms; and between Middle and Inner rocks 5 to 9 fathoms will be found.

LIGHTS.—A *fixed* and *flashing* light, 330 feet above the sea, and visible 24 miles, is shown from a white tower, 58 feet high, on the south-eastern point of Bustard head; it shows as a *fixed* white light during *one minute*, a *bright flash* preceded and followed by a short eclipse occupying another minute. From the westward, the light shows *red* southward of the bearing of E.S.E. During the continuance of the fixed light, a *red* sector of 5° of arc, is shown over Outer rock, the light bearing from the centre of the sector S. $\frac{1}{2}$ W.

Also from a white square tower 18 feet high, S.E. by S. 500 yards from the lighthouse, a *fixed* white light is shown at 280 feet above high water, which exhibits its greatest brilliancy between the bearings of S.W. $\frac{3}{4}$ S. and S. by E. $\frac{3}{4}$ E. Between the bearings of S.S.W. and S. by E. the light is obscured, by a screen, for a distance, at high water, of one mile outside Outer rock. Vessels therefore, when passing Bustard head, must keep this light in sight until past the ray of *red* light from the main lighthouse.

Pancake Creek,* immediately westward of the north-western point of Bustard head, affords good shelter to small vessels and steamers from all but north-westerly winds. The entrance is narrow, with a depth of from $2\frac{1}{2}$ to 3 fathoms, but there is no bar, the water gradually shoaling above a distance of three-quarters of a mile from the entrance. The western side of the channel is formed by a sand-spit, projecting from the low west point of the creek nearly in line to the extreme of Bustard head, which uncovers at half ebb, and whose limits can be easily seen. The anchorage is in

* See plan of Pancake creek, on Admiralty chart No. 345. A large steam-vessel which struck on Outer rock was saved by being beached in Pancake creek.

2 or $2\frac{1}{2}$ fathoms abreast a sandy bay between two rocky ledges extending from the shore, and near the moorings of the pilot vessel. Ledges of rock lie 2 cables off shore, abreast the boathouse on the east side.

Entering Pancake creek, round Bustard head at about three-quarters of a cable and steer up mid-channel between the shore and the sand-spit, to the anchorage.

The flood and ebb streams run through Pancake creek from $1\frac{1}{2}$ to 2 knots.

Fresh water can always be obtained at the back of the beach, abreast the anchorage.

The COAST from Pancake creek is low for $2\frac{1}{2}$ miles and fronted by a sandy beach, it then rises in height, and the rocky points are fringed with ledges from one to 3 cables off, to Richards point, the northern extreme of Rodd peninsula. Janson rock lies one mile westward of Bustard head, and the same distance off shore; it uncovers at low water. Ethel rock extends 3 cables from Richards point, and covers at three-quarters flood.

Rodd Bay is between Rod peninsula and Seal rocks to the westward, and is entirely open to the northward; the western part of the bay is mostly occupied by a shallow flat of from $1\frac{3}{4}$ to $2\frac{1}{2}$ fathoms, while the eastern part forms the entrance of Rodd harbour.

RODD HARBOUR,* on the western side of Rodd peninsula, runs E.S.E. from Rodd bay. The entrance from shore to shore is about $1\frac{1}{2}$ miles wide, and the navigable channel, between the banks, about one third of a mile, and close to the extreme of the long narrow sand-spit (covered towards the point with casuarina trees) which stretches southward from the south-western point of Rodd peninsula.

Rodd harbour affords shelter from all winds for moderate sized vessels just within Spit end; and vessels unable to progress against the strong S.E. winds which often prevail, will find good anchorage abreast Flora point at about one mile off shore in $5\frac{1}{2}$ fathoms, with Richards point bearing N.E. by E. $\frac{1}{2}$ E. and Spit end S.E. $\frac{3}{4}$ S.

DIRECTIONS.—Approaching Rodd harbour, pass about a mile from the north-west point of Rodd peninsula, and keep the shore at that distance until the centre of the deep bight on the mainland just eastward of Middle head bears about S. $\frac{1}{4}$ E. Steer for this bight until the eastern extreme of the hills on the south shore of the harbour (Blackney point) is open half a point southward of the extreme of the sand-spit; then steer about S.S.E. $\frac{1}{2}$ E. for the westernmost round-topped hill, and when Bird islet—a small island with a high bush in the centre—opens out southward of the sand-spit, haul up gradually so as to pass a cable from the extreme

* See plan of Rodd harbour, on Admiralty chart No. 345.

of the spit. When abreast the spit steer for Bird islet, and anchor a quarter of a mile from the spit. Small craft, not drawing more than 5 or 6 feet, may bring the end of the spit to bear West 2 cables distant, while vessels drawing more than 10 feet should not bring it westward of N.W. by N. The channel here has a depth of 4 fathoms in the centre, but it is narrow, the 3-fathoms channel not exceeding $1\frac{1}{2}$ cables in width. This channel is separated by a spit from another and wider channel nearer the south shore; the widest part, carrying a depth of 3 fathoms, bears North about two-thirds of a mile from Becher point.

The tidal streams abreast the sand-spit run from 2 to 3 knots.

Water can be at times obtained from among some rocks in the bed of a creek running into the harbour over the second sandy beach eastward of the spit.

Seven Mile Creek is between the land running southward from Middle head and Tongue sand, which covers at half flood; the anchorage, in $4\frac{1}{2}$ fathoms, is with Innes head, the western point of Middle head, bearing N.E. about half a mile. The approach to the creek which is narrow is between Tongue sand and the edge of the shoal water stretching northward from Middle head, bearing West 6 miles from the extreme of Rodd harbour sand-spit. The edges of the banks are not easily defined except at low water.

On the west side of Tongue sand, between it and Norton point, is another creek of from $1\frac{1}{2}$ to 6 fathoms joined at high water with Coliseum inlet.

Hummock Hill, a solitary wooded elevation 430 feet high and about three-quarters of a mile from the shore, lies W.S.W. 9 miles from Richards point, and is a useful mark for making Rodd bay, or South channel of port Curtis.

Coliseum Inlet, 2 miles West of Hummock hill, is narrow, with depths of 2 to 9 fathoms; 2 miles within the entrance it divides into two arms, the eastern arm being joined at high water with the creek entering at Norton point. A shallow bar crosses the mouth of Coliseum inlet $1\frac{1}{2}$ miles from the shore.

Mount Larcom.—Ranges of barren, rocky mountains, apparently of granitic formation, extend north-westward for 50 miles from the back of Rodd bay, between which and the sea the country consists of detached hills and low lands, intersected by numerous creeks. Mount Larcom, the most remarkable of these hills, in latitude $23^{\circ} 48' S.$, longitude $151^{\circ} 6' E.$, is 2,060 feet high, and is an excellent mark for making port Curtis.

PORT CURTIS,* one of the safest and most capacious harbours in Queensland, is between Facing and Curtis islands and the mainland, and affords secure anchorage from all winds for a large number of vessels.

* See Admiralty plan:—Port Curtis, No. 1,900; scale, $m = 1.95$ inches.

The approach to the port is sheltered and partially obstructed by shoal water and rocks extending northward from the western part of Rodd bay, and by East banks, across the entrance, at either end of which there is a ship channel.

The Western Shore of port Curtis from Coliseum inlet to South Trees point, a distance of 11 miles, is low and sandy, and more or less thickly timbered. Red cliff, 90 feet high, is 7 miles westward of Hummock hill, and S. $\frac{3}{4}$ E. 4 miles from Gatcombe head. Boyne river, $1\frac{1}{4}$ miles West of Red cliff, is obstructed by Entrance ledge which dries at half ebb and extends two-thirds of a mile from the shore.

South Trees Point, is low, with a small elevation on its extreme, and is covered with thick scrub and stunted trees. There is deep water half a cable from the northern edge of the point; but eastward the sands dry out half a mile, the edge being marked by a black beacon.

South Trees Inlet, on the western side of South Trees point, is 2 cables wide, and carries a depth of 2 fathoms for $1\frac{1}{2}$ miles; above this point the inlet is obstructed by low islands. The land on either side of South Trees inlet is low and swampy.

Auckland Creek.—From South Trees inlet westward for 3 miles to Auckland point, the low shore is fronted by a mud-bank and shoal water. Barney point, one mile East of Auckland point, is 50 feet high and is steep-to within 2 cables. Auckland creek is a narrow inlet, on the western side of Auckland point, winding through low land for about 4 miles from the sea. From the extreme of the point, the creek carries a width of from 300 to 350 feet, for half a mile, with a depth of from 12 to 24 feet at low water; the channel over the bar at the entrance is 200 feet wide, with a depth of 10 feet at low water. Two private wharves and one government cattle wharf, project from the eastern shore with depths alongside of from 8 to 15 feet, at low water. The western side of the creek is marked by a red buoy and beacon, the former placed on the edge of the mud-flat extending from the low mangrove point; there are also two triangular beacons on the west shore for leading into the creek in the deepest water, and a black buoy off the rocks near Auckland point. A spit of $2\frac{1}{4}$ fathoms extends nearly half a mile N.N.E. from the west point of the creek. The tidal streams are strong.

Gladstone.—The town of Gladstone is situated on Auckland point, and is the principal settlement in the neighbourhood of port Curtis. Cattle are exported in considerable numbers, mostly to New Caledonia. In 1872 the total value of the exports and imports amounted to 21,729*l*. There is steam communication with Brisbane and Sydney. Population, 427.

Calliope River, enters port Curtis $1\frac{1}{4}$ miles north-westward of Auckland creek; across its mouth is a bar of 3 or 4 feet water. Marble

and timber are exported from the river, the quarries and saw-mills being about 10 miles from the sea. Small vessels capable of crossing the bar can ascend to the saw-mills; the influence of the flood tide is felt about 4 miles higher up. Mud islet, and a black beacon on the eastern part of the flat, mark the north side of the river.

View Hill is a conspicuous object, 414 feet high, rising on the south-east extreme of Curtis island; one ridge descends from it south-eastward, terminating at a point a quarter of a mile northward of Quoin island, and another towards the east point of Curtis island.

Immediately westward of View hill is a creek which extends so far northward as nearly to sever the south-east end, from the main body of Curtis island. There are several small islets and shoals on the western side of the mouth of the creek with narrow channels between.

Quoin Island.—The greater part of the northern portion of port Curtis is occupied by sand-banks and islands, narrowing the deep-water channel westward of South Trees point, to half a mile. Quoin island the largest and easternmost is 130 feet high, and one mile long North and South; the greatest width of the island is one-third of a mile at the north end, tapering southward to a long low point whose extreme is N.N.E. $1\frac{1}{2}$ miles from Barney point.

Bushy Islet, $1\frac{1}{2}$ miles N.E. from the extreme of South Trees point, is a small islet awash at high water lying off the low south-western point of Facing island, and is the western point of Shoal bay, a deep indentation skirted by low mangrove shores, which dries at low water.

Manning Reef, covers at three-quarters flood and extends W.N.W. half a mile from Observation point, the southern point of Shoal bay; its western edge is marked by a red beacon. Shoal water extends for 2 cables outside the line joining Bushy islet and Manning reef, and continues a mile in the same direction to the edge of a rocky ledge, also marked by a red beacon, extending $1\frac{1}{2}$ cables from Facing island. Between the point next southward of the red beacon and Gatcombe head, a coral shoal extends one quarter of a mile from the shore; its edge is marked by a small red buoy.

GATCOMBE HEAD, the south point of Facing island, and the northern entrance point of port Curtis, is a bold and conspicuous bluff; its summit, which is 245 feet above the sea, is the highest part of Facing island. On the southern part of the head is a white hexagonal lighthouse, and upon the summit the signal station and flagstaff.

Oyster Rock, S.S.W. 2 cables from Gatcombe head lighthouse, is marked by a red iron beacon, from which a reflected light is shown over a portion of North channel. A shingle ridge joins Oyster rock with the

extreme of Gatcombe head, from which shoal water extends south-westward for $2\frac{1}{2}$ cables, and continues to the rocky ledge nearly one mile north-westward of the west extreme of the head.

Settlement Point, is the first projection on Facing island, north-eastward of Gatcombe head, distant about three-quarters of a mile; it was so named from Lieut.-Colonel Barney, R.E., having established a settlement on it in 1846. Foul ground extends 2 cables from the point.

East Point, three-quarters of a mile N. by E. $\frac{1}{2}$ E. from Settlement point, is a clifty head fringed with rocks extending a mile to the northward. The shore from East point runs N.N.W. nearly straight for 2 miles; one mile northward from the point is a conspicuous clump of casuarina trees.

East Point Ledge, a flat of from $1\frac{1}{2}$ to 3 fathoms, extends eastward one mile, between East point and the conspicuous clump. Two detached heads of $2\frac{1}{4}$ fathoms lie E.N.E. three-quarters of a mile, and one mile from East point.

Black head clump, on Curtis island, well open northward of North point, Facing island, bearing N.W., clears the extreme of East point ledge.

Seal Rocks, the outermost danger on the south side of the entrance to port Curtis, consist of a ridge of sand and rocks, which dries in patches at low-water springs, and extends off N.N.E. for $3\frac{1}{4}$ miles from the stony point at the foot of Hummock hill. A large boulder 5 feet above high water lies half a mile within the extreme of the rocks, forming a valuable guide when entering South channel. A depth of 3 fathoms will be found one mile N.N.E. of the boulder; and, westward, shoal water of less than 6 feet extends from the south shore nearly to the line joining the boulder with the east point of Boyne river.

Jenny Lind Bank, of from one to 2 fathoms, and about a mile in extent, is north-eastward of Seal rocks. Two small rocks, near the middle of the bank, which show at low water, lie N.E. $\frac{1}{2}$ E. $1\frac{1}{4}$ miles from the boulder on Seal rocks. A black buoy, in 6 fathoms, is moored off the northern edge of the bank.

East Banks, which lie between the two channels leading into port Curtis, are 6 miles long E.S.E. and W.N.W., and 2 miles broad. On the western part several sand-ridges dry at low water, and many patches of 2 to 6 feet will be found scattered over other parts of the bank. On the western side of the bank, about $2\frac{1}{2}$ miles from its eastern end, a narrow bight of deep water, of from 3 to 6 fathoms, runs in to the north-eastward for $1\frac{1}{2}$ miles. The south-eastern edge, N.W. by N. 2 miles from the boulder on Seal rocks, is steep-to; from here the banks run nearly in a straight line to within one-third of a mile of Gatcombe head. In bad weather the sea breaks heavily over the whole bank.

Buoy.—On the south-west edge of the East banks a red buoy is placed in 3 fathoms.

SOUTH CHANNEL, the principal channel leading into port Curtis, begins between Seal rocks and the south-east extreme of East banks, where it is $1\frac{1}{4}$ miles broad, with from 4 to 6 fathoms water, but there are some patches of $3\frac{3}{4}$ fathoms, midway between; it then runs nearly W.N.W., to the entrance of the harbour, the breadth varying from one to $1\frac{1}{2}$ miles, and carrying from 4 to 11 fathoms, sand.

NORTH CHANNEL passes between the south-east extreme of Facing island and the north-west end of East banks, and is from a quarter of a mile to half a mile broad, with depths of 4 to 6 fathoms in it. Although this is considerably shorter than South channel, the latter is to be preferred, especially for large vessels, as it is broader and deeper, and the tide streams are not so strong as in North channel, where they run from $2\frac{1}{2}$ to 3 knots. A patch of 3 fathoms lies near the middle of North channel, E. by S. 3 cables from Oyster rock.

North channel being lighted is available at night.

Buoys.—A red buoy, in 15 feet, on the north side of the channel, is moored at the end of the shoal water extending 2 cables from Settlement point. And a red buoy $2\frac{1}{2}$ cables W. by S. of Oyster rock; a depth of $2\frac{3}{4}$ fathoms will be found $1\frac{1}{2}$ cables southward of this buoy. Junction buoy, coloured red and black, in $2\frac{1}{2}$ fathoms, is on the south side of the channel, at the north-west extreme of East banks, S. by W. nearly 3 cables from Oyster rock beacon.

West Banks, lying parallel to the western shore of the port, extend from 2 miles N.E. of Red cliff to within $1\frac{1}{2}$ miles of South Trees point, and nearly join the sand-flat extending eastward from that point. The north-western end uncovers at low water, and a narrow ridge, of from one to 5 feet, runs nearly the whole length of the banks. A detached patch of $2\frac{3}{4}$ fathoms lies nearly half a mile off the east end. Between the banks and the shore the water is deeper, but out of the way of navigation.

Middle Bank is a narrow shoal, nearly midway between Quoin island and Barney point, forming the north side of the deep-water channel westward of South Trees point; from its east extreme in 3 fathoms, N. by W. three-quarters of a mile from South Trees point, the bank extends W. by N. $\frac{1}{2}$ N. 4 miles to Picnic island. A sand-ridge one cable broad, dries for 3 miles eastward from Picnic island, and there is less than 2 fathoms over the remaining portion of the shoal; a red buoy, a quarter of a mile westward of the eastern extreme, marks the southern edge of the bank.

Six cables N.N.E. of Barney point is a red buoy marking Rich rock a detached patch of 9 feet, one quarter of a mile southward of Middle bank.

A channel, half a mile wide, with from 4 to 7 fathoms, runs along the north side of Middle bank as far as the shoal water westward of Quoin island. Southward of Middle bank, depths of from 4 to 7 fathoms will be found westward to the entrance of Calliope river, where a patch of 3 fathoms lies nearly in mid-channel, 3 cables southward of Picnic island. The narrowest part of this channel is between Barney point and Rich rock southward of Middle bank, where the width is 4 cables.

North Bank, extends 2 miles East from Quoin island and covers at half flood. From 4 to 6 fathoms will be found between the bank and the west point of Shoal bay, and a narrow shallow channel, on the north side, separates it from Pelican banks, occupying the southern part of North entrance.

North Entrance is the opening which separates Facing and Curtis islands ; a small rocky islet, with a rock above water, lies in the northern mouth of the opening, where it is nearly one mile wide ; the breadth then increases southward to 3 miles abreast Quoin island and North bank ; but the opening is so full of shoals, and the tidal streams run with such strength, that it only affords a passage for boats into port Curtis.

The Narrows.—From the western part of port Curtis abreast Calliope river, the channel separating Curtis island from the mainland takes a north-westerly direction for 15 miles to The Narrows, which divide the head-waters of port Curtis from those of Keppel bay, and where the flood streams meet. The channel for 10 miles of this distance is generally along the Curtis island shore, and carries depths of 8 to 2 fathoms. Graham creek, 7 miles above Auckland point, runs for 5 miles north-eastward into Curtis island.

The mud-banks in The Narrows are about 2 feet above low-water springs, and the channel, which is mostly dry for 5 miles, is marked by red beacons to the eastward and black beacons to the westward. On the south shore, abreast three low mangrove islets immediately westward of The Narrows, and at the head of the creek running into Keppel bay, is a white beacon and tide gauge, showing the depth of water on the shallowest part of the channel. See page 130.

This passage, at high-water springs, affords a means of communication between port Curtis and Keppel bay, to vessels drawing 7 or 8 feet.

ANCHORAGE.—Good anchorage, out of the strength of the tidal streams, will be found in port Curtis, in 4 to 8 fathoms, off the entrance of South Trees inlet, with Gatcombe head in line with, or just shut in by, South Trees point ; but large vessels may anchor in the fairway, off the town of Gladstone, between Barney and Auckland points, in 5 or 6 fathoms. Also, on the west side of Facing island, off Observation point, in $5\frac{1}{2}$ or

6 fathoms, with the red beacon on Manning reef bearing North; this anchorage is generally selected by vessels waiting to proceed to sea.

Supplies of all kinds can generally be obtained in Gladstone. Water, except at the town, is with difficulty procured.

Repairs.—On the western side of South Trees point is a flat, gravelly beach, admirably adapted, and frequently used, for beaching vessels.

LIGHTS.—From the white lighthouse, 30 feet high, on Gatcombe head, a *fixed* light, visible 10 miles, is exhibited from an elevation of 66 feet. The light shows white, except between the bearings of S.W. $\frac{1}{4}$ S. and W. by S. $\frac{1}{2}$ S., and between N.N.E. and N.E., when the light shows *red*.

Also, an apparent *fixed* white light (reflected from Gatcombe head) 18 feet above high water, and visible 4 miles, is shown from the beacon on Oyster rock, between the bearings of from S.W. by W. $\frac{1}{2}$ W. to N.W. by N., and from N. by E. to E. by N. $\frac{1}{2}$ N.; this light when in line with Gatcombe head light, N. by E., clears Junction buoy. Within the distance of one mile the full effect of Oyster rock light is only seen when the eye is on a level with the light.

From the west side of the Pilot's dwelling on Gatcombe head, a *fixed* white harbour light is exhibited at 80 feet above the sea.

TIDES.—It is high water, full and change, at port Curtis, at 9h. 30m., springs rise 10 to 12 feet. The tidal streams run from 2 to 3 knots, in North and South channels, and over East banks; abreast Junction buoy its strength is sometimes 4 knots. The tides are much affected by the prevailing winds.

DIRECTIONS.—In making port Curtis, either from the southward or northward, mount Larcom may, as a general rule, be first steered for until the adjacent hills are clearly made out.

South Channel.—A vessel from the southward, entering by South channel, should, after passing the rocks off Bustard head, bring mount Larcom in line with Gatcombe head, bearing W. $\frac{3}{4}$ N., and steer for them until mount Stanley or Peak hill, a remarkable mountain, 2,430 feet high, 16 miles south-westward of Rodd bay, is in line with the high part of Seal rocks, S. by W. $\frac{1}{4}$ W. (view E., plan No. 1,900); then steer S.W. $\frac{1}{2}$ S. $2\frac{3}{4}$ miles, making due allowance for the strength of the stream, or until mount Larcom is about a quarter of a point open northward of Round hill, when a vessel would be about one mile W.N.W. of the highest part of Seal rocks; whence a N.W. by W. $\frac{3}{4}$ W. course will, by keeping South Trees point well open westward of Gatcombe head, or, when seen, Scrubby mountain in line with the south-west point of Curtis island and South Trees point, bearing N.W. by W. $\frac{3}{4}$ W. (view F., plan No. 1,900), lead directly into the harbour, passing half a mile southward of Gatcombe head.

When Gatcombe head lighthouse bears N.E., steer for Ship hill until mount Larcom opens northward of South Trees point, leaving on the port hand the black beacon on the north-east edge of the bank extending from South Trees point. When past South Trees point, keep the outer summit of Auckland point open of Barney point, to clear the 3-fathoms edge of shoal water extending half a mile from the south shore; leaving on the starboard hand the red buoys on the eastern end of Middle bank, and on Rich rock the 9-feet patch N.N.E. of Barney point. The south point of Mud islet in line with the South Saddle hill on mount Larcom range, bearing W. by N. northerly, leads south of the eastern part of Middle bank, as far as the 9-feet patch; but on approaching Barney point the islet must be opened north of the hill, until past the patch. To clear Middle bank, westward of the 9-feet patch, the north extreme of the high land northward of mount Larcom should be kept open of the south-western point of Curtis island.

Approaching South channel from the northward, Hummock hill should be steered for, and not brought to bear eastward of S. $\frac{1}{2}$ E., to clear the eastern edge of East banks. When Seal rocks are clearly seen, they may be approached within a mile, until mount Larcom is a quarter of a point open of Round hill; then proceed as before directed.

Working through South Channel, from the eastward, keep Bustard head lighthouse well open of Richards point, bearing E. by S. $\frac{1}{4}$ S., to clear Jenny Lind bank; and, standing towards Seal rocks, avoid bringing mount Stanley, or Peak hill, eastward of the high rock. The eastern side of West banks and the shoal water off Coliseum inlet will be cleared by not bringing mount Larcom nearer than a quarter of a point northward of Round hill; and when Red cliff bears S.W. by S. steer N.W. by W. with Rich hill, a small round top summit west of Ship hill; open north of South Trees point, which leads eastward of the banks until Settlement point is shut in by Gatcombe head; then haul up N.W. $\frac{1}{2}$ N. for View hill, on Curtis island. To avoid East banks, after entering South channel, Ship hill should be kept open of Gatcombe head, bearing N.W. by W. $\frac{1}{4}$ W., until nearly abreast Red cliff; or, the leading mark through, viz, Scrubby mountain, the south-west point of Curtis island, and South Trees point in line, will lead one-quarter of a mile westward of all the shoal water.

North Channel.—Making for North channel from the southward, the north-eastern side of East banks will be cleared by keeping mount Larcom open north of East point, Facing island; or, the northern edge of the conspicuous clump of casuarina trees on Facing island, seen midway between Ship and View hills, bearing W.N.W. (view D., plan No. 1,900), leads one quarter of a mile outside the banks. Oyster rock beacon in line with the north shoulder of O'Connell ridges, bearing S.W. by W. $\frac{1}{2}$ W.,

leads into North channel clear of East banks, and of the rocks off Settlement point; when nearing the red buoy off Settlement point, haul a little to the southward passing a cable south of Oyster rock, and the same distance northward of Junction buoy.

Should O'Connel ridge be obscured, the extreme of Gatcombe head in line with Settlement point, or open southward, bearing S.W. by W., will lead between East banks and East point ledge in not less than $3\frac{1}{4}$ fathoms; and when the eastern coast of Facing island is shut in by East point, steer to pass a quarter of a mile off Settlement point. When abreast Junction buoy, haul quickly into the main channel to avoid the shoal water of 2 and $2\frac{1}{4}$ fathoms projecting a quarter of a mile from the south-western extreme of Gatcombe head, and when South Trees point is closing with the south-western point of Curtis island, steer for Ship hill and proceed to an anchorage as before directed.

Working.—None but quick-working, handy vessels should attempt to beat in or out of North channel. The greatest care is required when standing towards East banks, to avoid being set on them, the water should not be shoaled to less than 3 fathoms, and towards Facing island, than $3\frac{1}{2}$ fathoms. The anchor should be kept clear for letting go.

At Night.—Vessels from the southward approaching North channel at night, must not bring Bustard head light to bear eastward of E.S.E., or stand towards East banks into less than 8 fathoms, until within the *red* sector from Gatcombe head lighthouse, which should be steered for bearing S.W. by W. $\frac{1}{2}$ W.; and when East point bears N.W. by N., or the eastern land of Facing island is shut in by East point, showing clear against the horizon, steer S.S.W. and open the *white* light from Gatcombe head before reaching Settlement point. Keep Oyster rock light a point on the star-board bow, pass one cable southward of the rock, and when the lights are in line, or Gatcombe head light changes to *red*, steer into the main channel, the vessel then being westward of Junction buoy. Approaching from the northward, the rocks off Facing island will be avoided by not bringing Bustard head light to bear eastward of S.E. by E., or standing into less than 10 fathoms, until within the sector of *red* light from Gatcombe head.

The harbour light on the west side of the pilot's dwelling is obscured when bearing eastward of E. by S. $\frac{3}{4}$ S. Vessels proceeding up the harbour should, on opening out the light, steer towards Auckland point; as, with the light in sight, West banks and the shoal ground extending off South Trees point, will be avoided.

FACING ISLAND, which forms the greater portion of the north-east side of port Curtis, is 8 miles long N.N.W. and S.S.E., and one to 2 miles broad; northward of the high land about Gatcombe head the island is low. Vessels proceeding along the coast northward of port Curtis

should not approach the shores of Facing island within 2 miles, rocks running out from the island nearly to that distance.

Sable Chief Rocks, a detached cluster of rocks, which cover at three-quarters flood, lie one mile off a point of Facing island, 3 miles northward of East point, with shallow water between them and the shore.

Mount Stanley or Peak hill, in line with East point, bearing South (view A., plan No. 1,900), leads eastward of Sable Chief rocks; and Connor bluff open of the north point of Facing island N.W. $\frac{3}{4}$ W. (view B., plan No. 1,900), leads north-eastward of the rocks, and of East point ledge.

CURTIS ISLAND is 25 miles long, and 13 miles broad near its north-western end; the south-east part is the most hilly, the greater portion of the island being low, and in some parts swampy. The best part of the island is at the north-west end near cape Keppel; hill and valley are there well proportioned; the grass is of a better kind and more abundant, the hills are more open, and there is very little underwood. The lower parts are not mangrove swamps, as on the mainland, but pleasant-looking valleys, at the bottom of which are ponds of fresh water, frequented by flocks of ducks.

Black Head.—From Tide point, the eastern point of Curtis island and west point of North entrance to port Curtis, the shore is low and sandy for 3 miles to Connor bluff; thence for 2 miles farther the coast is cliffy and fringed with rocks to Black head 190 feet high, with a conspicuous clump of trees on its extremity. At the eastern end of a sandy beach 2 miles northward of Black head there is landing for boats.

From Black head rocky points and sandy beaches extend N.N.W. 13 miles to cape Capricorn.

Rocky Islets.—Four miles S.E. $\frac{1}{2}$ E. of cape Capricorn are two small islets, surrounded by a rocky reef; the eastern islet is 65 feet high, and the western is low and composed of sand and rock. Between the islets and the shore are depths of 7 and 8 fathoms.

To clear Rocky islets cape Capricorn light should not be brought to bear northward of W.N.W.

CAPE CAPRICORN, so named by Captain Cook, from its geographic position; is 282 feet high, and looks white and barren; it may also be known by the two islets just mentioned, and by others to the north-westward: the cape is bold, with 11 fathoms within 2 cables of the eastern side.

LIGHT.—From a round stone-colour lighthouse, 39 feet high, on the summit of cape Capricorn, a white light, *revolving every minute*, and visible 23 miles, is exhibited at an elevation of 310 feet.

Telegraph.—On cape Capricorn is an electric telegraph and signal station.

KEPPEL BAY* is situated between cape Capricorn and Keppel isles, and contains numerous islands, rocks, and shallow banks; the islands are bold and steep-to, and the banks may be approached by careful attention to the lead. In the south-western part of the bay is the estuary of Fitzroy river.

Vessels going into Keppel bay will be much deceived by the colour of the water, for the shores of the bay being soft and muddy, the water running out by the deep channels with the latter part of the ebb, is thick, whilst the more shallow parts, over which the stream does not then set, are covered with clear sea-water.

Cape Keppel, 10 miles West from cape Capricorn is a green and fertile looking headland; the highest part is one mile from the extreme of the cape, and 290 feet above high water. The coast from cape Capricorn to cape Keppel, is low, flat, thickly wooded, and sandy, with shoal water extending nearly 3 miles off.

Boat rock, which covers at one third flood, lies upon the shoal E. $\frac{1}{2}$ N. $2\frac{1}{2}$ miles from cape Keppel.

Keppel Rocks.—Off cape Keppel runs a ledge of rocks in a N.W. by N. direction, the outer of these, Keppel rock, is on the edge of the shoal water; it is 55 feet high, with deep water close-to, but there are only 18 feet half a mile N.E.

Timandra Bank.—Three miles West from the outer Keppel rock a black buoy is placed in 7 fathoms water, one-third of mile north-westward of Timandra bank which extends from Keppel rocks, and is connected with the mainland of Curtis island.

Hummocky Island lies N.W. $\frac{1}{2}$ W. 6 miles from cape Capricorn, with from 8 to 12 fathoms water between. It was named "Hummocky" by Captain Flinders, from three well-marked hummocks or hills, the centre one being considerably smaller than the others; the highest two are 418 feet above high water. There is a small detached rock a quarter of a mile off the south side, which dries at low water; every other part of the island is clear of danger. No fresh water has been found; the vegetation consists of grass and a few bushes.

Fairway and Ship Rocks.—One mile from Hummocky island, and in a direct line to cape Capricorn, is a bold rock 82 feet high, called Fairway rock; and one mile N.E. from Fairway rock is Ship rock, which is 133 feet above high water; both these rocks are conspicuous marks when entering Keppel bay from the southward; they are steep-to in every direction, and there is deep water between them and Hummocky island.

* See Admiralty plan, Keppel bay, No. 363; scale, $m = 1\cdot0$ inch.

Cottier Bank.—At the distance of 8 miles W. by N. $\frac{1}{2}$ N. from cape Capricorn, and N.E. $\frac{1}{2}$ E. 3 miles from cape Keppel, a black buoy is placed in 5 fathoms water, on the outer edge of Cottier bank, which is separated by a narrow channel from the shoal water of Curtis island; $7\frac{1}{2}$ feet is the least water that has been found on this shoal. Cockscomb hill open north of Peak island or Second Lump bearing W. by N. $\frac{1}{2}$ N., leads northward of the bank and of the shoal water extending from the shore westward of cape Capricorn.

PILOT Station.—About 2 miles W.S.W. from cape Keppel is the pilot station on Curtis island: shoal water (Timandra bank) extends from it 2 miles to the northward. Vessels are boarded by pilots off Keppel rocks.

LIGHTS.—Two *fixed* white lights, visible 7 miles, are shown from the pilot station; the lights are 200 yards apart, and when in line, bearing N.W. $\frac{1}{2}$ N. and S.E. $\frac{1}{2}$ S., point out the direction of Timandra bank buoy.

Little Sea hill, are two small *fixed* white lights, to assist in passing Timandra bank and reaching the anchorage under Little Sea hill. The lights are 533 yards apart and bearing nearly N. $\frac{1}{2}$ E. and S. $\frac{1}{2}$ W. from each other, elevated 93 feet and 18 feet above the sea, and visible respectively 9 miles and 8 miles. The upper light is obscured between the bearings of S.E. $\frac{1}{2}$ S. and S.E. $\frac{1}{2}$ E. The lighthouses are of wood, painted red. When in line these lights show the direction of Timandra bank buoy.

Division Point.—From the pilot station the coast runs south-westward to Little Sea hill, and is low and sandy, with shallow water extending off $1\frac{1}{2}$ miles. From Little Sea hill point the low and swampy shore turns sharply S.E. by S. for 5 miles to Division point, the western entrance point of the creek running along the Curtis island shore, for 5 miles farther, to The Narrows, which connect the waters of Keppel bay and port Curtis. About a mile southward of Division point there is a depth of 7 fathoms, thence the water shoals gradually to the first white beacon on the south side, at which is the tide-gauge showing the depth of water which will be found in The Narrows. See page 124.

Deception and Connor Creeks.—From the west side of Division point, Deception creek extends southward about 4 miles; the greatest depth in this creek is 4 fathoms. Connor creek, 2 miles westward of Deception creek, is nearly a mile wide, and runs southward for nearly 8 miles, with from 2 to 9 fathoms. These creeks flow through extensive mud and sand flats, fringed with low mangrove trees. A sand-spit dries for $2\frac{1}{2}$ miles northward from the point dividing the two creeks.

Centre Bank, half a mile in extent with $2\frac{1}{2}$ fathoms on the shoalest part, lies in the middle of the channel leading into Fitzroy river, and

N.W. by W. $\frac{1}{2}$ W. 3 miles from the pilot station. Depths of 6 and 7 fathoms will be found on either side of the bank.

East Bank, is the outer of two patches lying south-eastward of a long spit of one to 3 fathoms, extending N.E. by N. $8\frac{1}{4}$ miles from Cattle point, the northern point of the entrance to Fitzroy river; the least water on the bank is $2\frac{1}{2}$ fathoms, N.W. by N. 4 miles from the pilot station, and $1\frac{1}{2}$ miles North of Centre bank.

Anchorage.—The anchorage for large vessels is south-westward of Little Sea hill, in 4 or 5 fathoms, and is sheltered from all winds except those from north and north-west; but small vessels caught in a northerly gale can run up between Curtis island and the mainland, and find good shelter with any wind. Pacific creek, is a small creek half a mile eastward of Little Sea hill, into which the schooner *Pacific* ran and was saved, after losing her anchors during a northerly gale.

The Western Shore of Keppel bay northward from Fitzroy river is low and thickly wooded, with a few small creeks, all difficult of access on account of the shoal water outside, which extends from one to 4 miles from the shore.

Broad mount, 1,338 feet in height, is a conspicuous hill on the north side of Fitzroy river; a ridge descends eastward from it to low land, terminating at Cattle point.

There are high ranges of hills extending back from the coast; mount Berseker, 1,660 feet high; mount Archer, 1,612 feet; and Cockscomb, 1,270 feet, with others from 558 to 1,200 feet; these ranges are covered with trees nearly to the top. The coast line is all sand.

Second Lump and Arch Rock.—Peak island or Second Lump lies N.W. by W. 9 miles from cape Keppel; it is shaped like a sugarloaf, and is 370 feet high; a reef extends S.E. by S. one mile from the south end terminating at Arch rock, which is 60 feet high. This rock has a hole or arch, through which daylight can be seen. There is no passage between Second Lump and Arch rock.

Split Rock, so named from its being divided into two parts, lies half a mile from the north end of Second Lump; there is a passage between Split rock and Second Lump.

Divided Island.—About 2 miles N.N.W. from Second Lump is a small island which at high water is divided into two parts; it is low, and N.N.W. half a mile from the north end is a rock which uncovers at low water.

Wedge Island lies W.N.W. 2 miles from Divided island; it is rather more than half a mile long, and 200 feet high.

Pelican Island lies N.N.W. $\frac{1}{2}$ W. 2 miles from Wedge island; it is very narrow, and lies East and West, half a mile in length, and is

151 feet above high water ; Pelican rock is a detached rock about 50 or 60 feet high, a quarter of a mile S.W. from the west end.

Several small islets and rocks lie inside these islands, on the shoal water extending from the western side of the bay.

Supplies.—Fresh and salt beef can be obtained at Monte Christo station on Curtis island. Water is always procured with difficulty, but there are permanent water ponds about a mile eastward of the pilot station. Wood is abundant and easily cut. Turtle and sea birds are plentiful on the Inner islands, especially on Second Lump ; in October, November, and December, turtle are almost sure to be obtained during moonlight nights.

FITZROY RIVER, which empties into the south-western part of Keppel bay, is 6 miles wide at its mouth, between Cattle and Little Sea hill points, and about 300 yards at Rockhampton, the head of ocean navigation. The passage of the river is impeded, at several points, by shallow flats over which there is not more than $1\frac{1}{2}$ feet, but a channel, through the flats, of about $3\frac{1}{2}$ feet is maintained by dredging and the erection of a training wall. No strangers should enter the river without a pilot.

It is worthy of remark that the Queensland alligator, which often attains a length of 20 feet, is rarely if ever found south of Fitzroy river, but it frequents all the streams northward.

ROCKHAMPTON, an important and rapidly rising town of 8,052* inhabitants, is situated on the south bank of Fitzroy river about 35 miles from the sea, and is the port of shipment to a vast extent of country to the westward. The town is well supplied with water ; it possesses numerous public buildings, including an hospital. The principal exports from Rockhampton are wool, gold, copper, hides, tallow, and preserved meats. In 1872 the total value of exports and imports was 727,429*l.* ; one half the amount of exports being from wool. It is the starting point of the Great Northern Railway.

A line of steam vessels communicate once a week with Brisbane and Sydney, and the river is a port of call to the Eastern and Australian mail steamers from Singapore.

Patent Slip.—There is a patent slip in Fitzroy river capable of taking up the small vessels trading on the coast.

Buoys and Beacons.—A black buoy, S.W. by S. $1\frac{1}{4}$ miles from Little Sea hill point, is moored on the edge of the shoal water fronting Deception and Connor creeks on the eastern side of the deep water channel leading into Fitzroy river, and a red buoy on the western side of the channel S.W. by W. 2 miles from Little Sea hill point, and $2\frac{1}{4}$ miles N.N.E. of the light-vessel ; a black buoy at half a mile W.S.W. from the

* *Australasia*, A. A. Wallace, 1879.

light-vessel, marks the eastern end of Haynes spit. There is a black beacon on the western edge of Curlew spit, and a second black beacon $2\frac{1}{4}$ miles westward, on the northern edge of Haynes spit. The channels of the river, about the mouth, are shown by white crossing marks upon the shore, and by beacons and buoys, those coloured black to be left on the port hand, and the red on the starboard hand.

LIGHTS.—A *fixed* white light, visible 8 miles, is shown from a light-vessel in 7 fathoms, within the entrance of Fitzroy river, S.W. $\frac{1}{4}$ S. $4\frac{1}{4}$ miles from Little Sea hill point.

From a light-vessel, moored head and stern, about 7 miles below Rockhampton, between Second and Upper flats, a *red* light, visible 5 miles, is exhibited ; from this vessel day and night Tidal signals are shown.

Lights are also placed on the beacons at either end of the cutting through Upper flats.

Signals.—The following Tidal signals, showing the depth of water in the cutting through Upper flats, are exhibited from the light-vessel below Rockhampton :—

	ft. in.		ft. in.
Ball north yard-arm - -	6 0	Flag above ball north yard-arm -	11 0
Ball south yard-arm - -	6 6	Flag above ball south yard-arm -	11 6
Flag north yard-arm - -	7 0	Ball above flag north, ball south -	12 0
Flag south yard-arm - -	7 6	Ball above flag south, ball north -	12 6
Ball north and south yard-arms -	8 0	Flag above ball north, ball south -	13 0
Flag north and south yard-arms -	8 6	Flag above ball south, ball north -	13 6
Two balls north yard-arm - -	9 0	Two balls north, flag south -	14 0
Two balls south yard-arm - -	9 6	Two balls south, flag north -	14 6
Ball above flag north yard-arm -	10 0		and up-
Ball above flag south yard-arm -	10 6		wards.

At Night:—

	ft. in.		ft. in.
White light north side - -	6 0	Red light north side, white light	
White light south side - -	7 0	south side - - -	11 6
Red light north side - -	8 0	White light north side, green light	
Red light south side - -	8 6	south side - - -	12 0
Green light north side - -	9 0	Green light north side, white light	
Green light south side - -	9 6	south side - - -	12 6
White light north side, white light		Red light north side, green light	
south side - - -	10 0	south side - - -	13 0
Red light north side, red light south		Green light north side, red light	
side - - -	10 6	south side - - -	13 6
White light north side, red light		Green light north side, green light	
south side - - -	11 0	south side - - -	14 0

TIDES.—It is high water, full and change, at the pilot station in Keppel bay, at 9h. 0m. ; springs rise 11 feet, neaps 7 feet.

At Upper flats Fitzroy river, there is a depth at low water in the natural channel of about 18 inches, and of 3 feet through the cutting.

The rise of springs here is $9\frac{1}{2}$ to 11 feet, and of neaps $6\frac{1}{2}$ to 9 feet; and high water, full and change, at 11h. 20m.

The flood in Keppel bay comes from the northward, and the ebb from the southward. The strength has not been found to exceed $1\frac{1}{2}$ knots, and seldom attains that rate, except within the influence of the river.

Off cape Capricorn, when near the coast, the flood will set into Keppel bay from the southward and the ebb run out to the southward close round the cape; this appears to be an eddy tide.

DIRECTIONS.—Entering Keppel bay from the southward with a fair wind, round cape Capricorn at the distance of half a mile, when Cockscomb hill will be open north of Second Lump, bearing W. by N. $\frac{1}{2}$ N.; this mark will lead clear of Cottier bank and all the shoal water extending from Curtis island. When Broad mount comes on with the outer Keppel rock, bearing W. by S. $\frac{1}{2}$ S., the vessel will be within half a mile of the black buoy on Cottier bank, and may steer W. $\frac{3}{4}$ S., which will lead to the black buoy north-westward of Timandra bank; the lead should be kept going, as this course will lead along the edge of shoal water. At the buoy on Timandra bank, South hill should be in line with Little Sea hill point, bearing S. $\frac{1}{2}$ W. From this position steer S.S.W. for $3\frac{1}{2}$ miles, until the low mangrove shore of Curtis island opens out westward of Little Sea hill point, bearing S.E. $\frac{3}{4}$ S., which leads westward of the shoal water northward of Sea hill, and towards the anchorage westward of the point.

Ships from the northward should pass outside Keppel islands; there is nothing to be gained by venturing inside, where the water is shoal, and likely to be altering in depth during and after the rainy seasons.

There is sufficient depth of water for large vessels $4\frac{1}{2}$ miles beyond Little Sea Hill point in a S.W. by S. direction, as far as the light-vessel in the entrance of Fitzroy river. It is not, however, advisable for vessels drawing more than 12 feet, to venture above Timandra bank buoy without a pilot, for during the heavy freshets of the rainy season banks are thrown up and others washed away.

From the shifting nature of the shoals in Fitzroy river, masters of vessels who are not constantly visiting the port will save much time by taking a pilot.

At Night.—After passing Keppel rocks, on a west course, be careful not to bring the two lights at the pilot station in line before crossing the line of lights at Little Sea hill. When both these lines of lights are crossed, which should be done within a short distance of the point of intersection, the Timandra bank buoy will be passed; then steer S.S.W. for the light-vessel, and if intending to anchor under Little Sea Hill point, haul up when the upper light is eclipsed on a S.E. $\frac{1}{2}$ S. bearing, and steer

S. by E. $\frac{1}{4}$ E. While standing in, this light will again be visible, and when it bears N.E., anchorage will be found in 5 fathoms at low water.

It must be borne in mind that between Little Sea Hill point and the Timandra bank buoy both flood and ebb tides set strongly across the line of lights at Little Sea hill.

Leaving Keppel bay, ocean bound ships leaving Keppel bay should clear the Barrier reef without delay, and are recommended to use Capricorn channel instead of Curtis channel, for with the prevailing south-east winds and set of tide towards the reef it is tedious and even dangerous to beat down the latter channel. By taking the Capricorn channel a vessel will have a fair or leading wind to North reef and be clear of it in a few hours by steering N.E. $\frac{1}{4}$ E. for 45 miles. See Capricorn channel, page 197.

ISLANDS and REEFS near the Coast between SANDY CAPE and KEPPEL ISLES.—Lady Elliot islet is a coral island in lat. $24^{\circ} 7' S.$, long. $152^{\circ} 45' 30'' E.$, and N.W. 45 miles from Sandy cape lighthouse. It is half a mile in circumference, and covered with scrub and stunted trees, which attain an elevation of 50 feet above high-water; the surface of the islet being about 15 feet above the same level. The islet is encircled by a coral reef, which stretches out half a mile to the northward and eastward; and a long coral spit runs off its north-eastern point.

There appears to be an average depth of about 22 fathoms at the distance of a mile all round the island. In south-easterly winds there is anchorage under the lee of the island in from 10 to 20 fathoms, sand and coral, at about a quarter of a mile from the shore.

Myriads of sea birds come to Lady Elliot islet, which appears to be one of the great breeding-places off the neighbouring coast. Green turtle were procured here in abundance, in 1843, great numbers resorting to the islet to deposit their eggs.

Lady Elliot islet, and the islets and reefs subsequently described, are situated near the edge of a bank of soundings stretching out from the mainland, and extending north-westward from Breaksea spit; Lady Elliot islet lying 3 miles, and the Bunker group and One Tree islet, 8 miles within the 100-fathoms edge of the bank.

The mainland in the vicinity of Bustard bay is visible in fine weather from these islets and reefs, but its distance (about 40 miles) renders it too indistinct to afford any leading mark.

From No. 1 Bunker islet, Round hill, near Bustard bay, bears S.W. 85 miles; and from One Tree islet the same hill bears S. $\frac{1}{4}$ W. 46 miles.

LIGHT.—From a white iron tower, 45 feet high, on the south-western side of Lady Elliot islet, a white light *flashing every half minute* is exhibited at an elevation of 60 feet, and is visible 12 miles.

TIDES.—It is high water, full and change, at Lady Elliot islet at 9h.; springs rise from 7 to 8 feet.

BUNKER GROUP consists of three small coral islets, similar to Lady Elliot islet, from which No. 1 (the south-easternmost islet of the group) bears nearly N.W. by W. $\frac{3}{4}$ W. 23 miles.

No. 1 islet is about one-third of a mile long, oval-shaped, and covered with scrub; there are a few scattered trees on it, the tops of which are between 50 and 60 feet above the level of the sea. The island is surrounded by a coral reef, which extends 2 miles from its north-eastern, and two-thirds of a mile from its south extreme; the reef is steep-to on all sides.

No. 2 islet lies N.W. by N. $3\frac{1}{4}$ miles from No. 1, to which it is similar in appearance; but at high water it is divided into two islets. It is encircled by a coral reef about $4\frac{1}{2}$ miles in circumference, leaving a clear channel $1\frac{1}{2}$ miles broad, with 16 to 20 fathoms water, between it and the reef of No. 1 islet.

No. 3 islet, the north-westernmost of the Bunker group, lies W.N.W. 5 miles from No. 2. At two-thirds of a mile north-eastward of it is a smaller islet, the two being nearly connected at low water. These islets are also wooded, but smaller than the others; they are enclosed by a reef 4 miles in circumference, which is separated from that of No. 2 islet by a channel $4\frac{1}{2}$ miles wide with 30 to 34 fathoms water, and level bottom.

CAPRICORN GROUP, so named by Capt. F. P. Blackwood from its central portion being on the tropic of Capricorn, is a cluster of small coral islands and reefs north-westward of Bunker group, to which they are similar in aspect, but occupy a much larger space. To render the description clear, the eastern, or outer line is first detailed, tracing the various islets and reefs as they would appear coming from seaward.

One Tree Islet, N.W. $\frac{3}{4}$ N. 21 miles from No. 3 Bunker islet, derives its name from a remarkable tree of the pandanus species, growing on it, which being 40 feet high, can be distinguished at a distance of 12 or 15 miles, appearing like a small rock on the horizon. The islet, which lies in lat. $23^{\circ} 30' 30''$ S., long. $152^{\circ} 8'$ E., is about a quarter of a mile in extent, and formed of coral sand, the highest part being about 15 feet above the level of the sea. It is situated on the south-eastern end of an oval-shaped reef, nearly 4 miles long, and about $1\frac{1}{2}$ miles broad. At the north-west end of the reef is a sand-bank which is covered at high water.

Nearly in line between No. 3 Bunker and One Tree islets, are three large irregular, oval-shaped reefs, with clear channels between them; their centres lie respectively 3 miles, 9 miles, and 14 miles from the former islet.

The edges of these reefs, which appear to be steep-to, are uncovered at low water, and the sea breaks heavily upon them, especially on their weather, or eastern sides.

Each of the reefs lies in a N.E. and S.W. direction; the south-easternmost is about $2\frac{1}{2}$ miles long and $1\frac{1}{2}$ miles broad, and has a sand-bank on its south-west extreme, nearly covered at high water. The north-westernmost reef, which is the largest, is $3\frac{1}{2}$ miles long, and nearly $1\frac{1}{2}$ miles broad. The soundings in the channels between the reefs are generally deep, ranging from 13 to 35 fathoms; there are a few irregular soundings, which are easily distinguished from aloft, by the colour of the water.

At S. by W. $\frac{1}{4}$ W. $6\frac{1}{2}$ miles from One Tree islet, is a small sand-bank, dry at low water; a reef extends $1\frac{1}{2}$ miles to the north-eastward of this sand-bank, at the extremity of which are heavy breakers. It has deep water close-to all round.

Wreck Islet (so named from there having been found, by the *Fly*, in 1843, the remains of two wrecks on its reef, with traces of their crews on the island,) lies in lat. $23^{\circ} 19' 30''$ S., long. $151^{\circ} 59'$ E., and N.W. $\frac{1}{4}$ N. $13\frac{1}{2}$ miles from One Tree islet. It is a narrow strip of sand about one-third of a mile long, and from one to $1\frac{1}{2}$ cables broad; the sand on the central part has accumulated, forming a wooded mound, the tops of some of the trees attaining an elevation of about 40 feet above the level of the sea. The islet is encircled by a reef, which extends $1\frac{1}{2}$ miles to the north-eastward, and a quarter of a mile to the southward of the island.

Nearly in line between One Tree and Wreck islets, and $6\frac{1}{2}$ miles from the former, is the northern extreme of a long line of heavy breakers, extending to the southward, and leaving a passage on either side. The channel is 2 miles wide between these breakers and One Tree islet, and although not closely examined, H.M.S. *Bramble* worked through, in from 12 to 25 fathoms water.

The passage South of Wreck islet, which is nearly $5\frac{1}{2}$ miles broad, appears to be clear directly through the group; as far as was examined, the depths in it were from 20 fathoms to no bottom with 30 fathoms, and no appearance of dangers could be seen from aloft.

A small wooded island, on the western edge of a coral reef, lies nearly N.W. by W. $\frac{3}{4}$ W. 3 miles from Wreck islet; at about 2 miles to the north-eastward of it is an irregular, oval-shaped reef, nearly 3 miles long S.E. and N.W. with a sand-bank on it dry at low water. Some shallow patches lie westward of the sand-bank.

The channel formed by Wreck islet reef and the islet and reef just described, is 2 miles wide, with 23 and 28 fathoms water in the middle.

North Reef, in lat. $23^{\circ} 11'$ S., long. $151^{\circ} 56' 10''$ E., and N.N.W. $\frac{1}{4}$ W. about 9 miles from Wreck islet, is merely a sand-bank, a few

feet above high-water, with some stunted bushes on its centre; it is surrounded by a reef one mile in diameter. See p. 197.

There is a channel between North islet and the reef already described to the southward of it, 3 miles wide, with from 17 to 28 fathoms water in the centre; but on its southern side, bordering the reef, there appeared to be foul ground.

The bank of soundings extends farther to the eastward from this part of the Capricorn group: at 21 miles to the eastward of North islet, the *Fly* found the depth 88 fathoms, sand; but the level bank of 35 and 40 fathoms extends only to the average distance of 8 miles from these islets and reefs, as it does from Lady Elliot islet and Bunker group to the southward.

At N.W. $\frac{1}{2}$ W. 10 miles from North reef, is a rocky patch of circular shape, $1\frac{1}{2}$ miles in diameter, with its centre in lat. $23^{\circ} 3' S.$, long. $151^{\circ} 49' E.$; the least water found on it was 6 fathoms, and the average depth 9 fathoms. It is steep-to, there being from 20 to 25 fathoms all round it.

At about 3 miles westward of this patch the *Fly* ran over irregular ground, suddenly shoaling from 25 to 13 fathoms; it is probable that there are many of these knolls scattered in this vicinity.

LIGHT.—North reef lighthouse is 80 feet high, circular, and painted white.

The light is a *fixed and flashing* light, showing *fixed* for *two minutes*, followed by *two flashes* in succession at an interval of *one minute*, the series of changes occupying *four minutes*; it is elevated 72 feet above high water, and should be visible in clear weather from a distance of about 13 miles.

Mast-head Islet, the south-westernmost of the Capricorn group, lies nearly W. by S. $\frac{1}{4}$ S. 21 miles from One Tree islet, and is three-quarters of a mile long East and West, and one-third of a mile broad. It is thickly vegetated to the margin of the sandy beach, and the tops of the trees are about 50 feet high; the islet is situated on the west end of a reef of oval shape, about $2\frac{1}{2}$ miles long East and West, and $1\frac{1}{2}$ miles broad; the reef is steep-to.

At 2 miles southward of Mast-head islet is the east point of Polmaise reef, separated from the islet by a channel $1\frac{1}{2}$ miles broad, with from 5 to 18 fathoms water in it; the reef which covers at high water is $2\frac{1}{2}$ miles long, East and West, and a mile broad, with rocks extending half a mile westward.

Irving Reef, is a detached patch of $2\frac{1}{2}$ fathoms, 2 miles West of the reef just described, with 4 and 5 fathoms between. This reef, which appears to be to the westernmost danger of Capricorn group, lies W. by S. $\frac{1}{4}$ S. 5 miles from Mast-head islet, and E. $\frac{1}{4}$ S. 22 miles from cape

Capricorn, contracting the channel between the reef and Curtis island to 20 miles in width; depths of 4 and 6 fathoms will be found half a mile westward of the reef.

In order to clear Irving reef and the reef eastward of it, when passing through Curtis channel, the beach of Mast-head islet should not be raised above the horizon.

Rock Cod Shoal is a bank of sand and coral of less than a mile in extent, with 4 fathoms on the shoalest part, bearing N.E. $\frac{1}{2}$ N. $17\frac{1}{4}$ miles from Gatcombe head, and 11 miles S.S.W. $\frac{1}{2}$ W. from Mast-head islet, and surrounded for a considerable distance with irregular soundings varying from 6 to 10 fathoms, with two detached shoal patches of 8 and $5\frac{1}{2}$ fathoms at 2 miles to the south-west. This shoal was discovered by H.M.S. *Bramble* at night.

Heron Islet, N.E. $\frac{1}{4}$ E. 12 miles from Mast-head islet, is the most central, elevated, and densely wooded of Capricorn group, the tops of the trees being 60 feet above high water; it derives its name from the numbers of herons seen on it. This islet, barely three-quarters of a mile long, lies on the west end of an extensive coral reef, which terminates to the eastward, near the mass of breakers which lie north-westward of One Tree islet.

An irregular-shaped reef extends 5 miles south-westward of Heron islet, from which it is separated by a deep channel half a mile wide; from this reef, a shoal with 6 fathoms water on it, extends towards Mast-head islet, having on its west end a small sandy islet, slightly vegetated, and lying 3 miles north-eastward of Mast-head islet.

As far as could be seen from the mast-head, there appeared to be clear passages in from the sea towards Heron islet; that to the northward of One Tree islet being 2 miles broad, and that to the southward of the islet 4 miles broad, the depths varying from 12 to 25 fathoms in the former, and from 28 to 35 fathoms in the latter channel.

North-west Islet, about N. by W. 14 miles from Mast-head islet, is very similar in size and aspect to the latter, the trees on it being about 50 feet high; it is situated on the west end of a coral reef 6 miles long and 2 miles broad. There is deep water close to the edges of the reef, which are considerably elevated at low-water springs.

Vessels entering the Inner route by Curtis or the inshore channel, frequently sight Mast-head and North-west islets. The space between them appears clear of dangers, the depths only varying from 18 to 21 fathoms; and the channel leading into it from seaward, between Wreck and Heron islets, is broad and safe.

The space between the east end of North-west islet reef and the reefs to the northward of Wreck islet should be avoided on account of numerous sunken patches, one of which has $4\frac{1}{2}$ fathoms water on it.

There now only remains one more islet of the Capricorn group to be described. It is thickly wooded, and lies 5 miles to the north-eastward of North-west islet, and 9 miles within the western line of islets and reefs; but for a small patch lying about a mile to the north-westward of the islet, there would be a clear channel on either side of it. No dangers were seen from the mast-head between this islet and the 6-fathoms patch to the northward, noticed at page 138, but detached sunken patches may yet remain undiscovered.

The features of all the islets and reefs of Capricorn group are so similar, that a general description will apply to all.

The reefs are generally of an irregular, oval shape; their edges, which dry at low water, are composed of soft, spongy, and decayed coral matter, on which are scattered masses of coral rock, which from their appearance at different times of the tide are called negro heads. The inner portions of the reefs are shallow lagoons, where patches of sand have occasionally washed up; these, when accumulated in sufficient masses to withstand the influence of the waves, have become the resort of sea birds; seeds carried by them, and probably by the currents of the ocean, have germinated, and rank vegetation has followed. The islets are generally on the leeward sides of the reefs, and those most remote from the outer line are the most densely vegetated. No fresh water could be discovered on any of the islets.

Productions.—Turtle in great numbers frequent the sandy beaches of these islands to lay their eggs; there are two kinds, the green turtle and the hawk bill; the former are the more abundant.

The shell of the hawk bill, and the great quantity of trepang to be procured on the reefs, may be well worthy of attention; trepang always meets with a ready sale in the Chinese market.

Sea birds also flock to these islands in great numbers, a circumstance worthy of note, as it has been remarked by those acquainted with the perilous navigation of these coral seas, that the flights of birds and their numbers assist the judgment, in anticipation of danger. The ground dove and land-rail were also found on the islets.

TIDES.—It is high water, full and change, at Heron islet, near the centre of Capricorn group, at 9h.; springs rise about 10 feet. The streams run from 2 to 2½ knots at springs; the ebb setting to the eastward, and the flood to the westward.

DIRECTIONS.—In making a passage, there is no inducement for the navigator to choose his route through Capricorn and Bunker groups; should necessity, however, oblige him to do so, a vigilant look-out from aloft affords the best guidance. In approaching these islets and reefs from seaward, the lead must not be neglected, as the extensive bank of

soundings, which stretches eastward will give timely notice of the proximity of the groups. The channels between the reefs are spacious and clear; and fair shelter from the heavy gales which are occasionally met with here, may be safely calculated upon under the lee of the reefs.

Curtis channel, between Bunker and Capricorn groups, and the mainland from Bustard bay to cape Capricorn, is about 30 miles broad, except abreast the south-east end of Curtis island, where it is contracted to 20 miles by Irving reef south-westward of Mast-head islet. The soundings are regular, and there do not appear to be any other outlying dangers than Rock Cod shoal, already described. When passing westward of Irving reef, care must be taken not to raise the beach on Mast-head islet above the horizon, as the ebb stream out of Keppel bay sets directly towards that islet.

KEPPEL ISLES,* are a group of islands and rocks forming the north side of Keppel bay and extending 16 miles from the shore. The greater part of the space between the islands and the shore is occupied by shallow water of from one to 3 fathoms.

Great Keppel Island is 12 miles in circumference, and $1\frac{1}{2}$ miles across, the highest part is 542 feet above high water. There are a few natives, who are very shy, and it is difficult to understand how they find subsistence; their presence, however, indicates that fresh water must be found on the island, although none could be discovered near the coast. Gold is said to have been found on the island. There are no trees, the only vegetation being rank grass and a few bushes. The native name of the island is *Wapparaburra*.

Humpy Island, so named from the number of humpys or native huts on it, appears to have been formerly joined to Great Keppel island; it lies one mile South, and between is a narrow ridge named Halfway island. There is a channel for small vessels inside Humpy island, but it is not recommended.

Miall Islands.—Off the north-west point of Great Keppel are two small islands, the most distant is 216 feet high, and one mile in circumference. The other, Middle island, is nearly connected with Great Keppel by a sand-bank. A rocky patch, which shows at low water, lies one mile N.E. from Middle island, and is one mile distant from the shore of Great Keppel island.

Barren Island or First Lump.—About 21 miles N.W. by N. from cape Capricorn, is Barren island called by Flinders First Lump; it

* See Admiralty chart:—Australia, east coast, sheet XII, Keppel isles to Percy isles, with views, No. 346; scale, $\frac{1}{4}$ = 0.25 of an inch.

is precipitous on all sides, and 548 feet above high water. At half a mile from its north-east end is a detached rock called the Child.

First Lump and Child are the outer and most easterly of all the Keppel islands.

Egg Rock.—Two and a half miles from First Lump and directly in a line with cape Capricorn, stands a rock 49 feet above high water, and named Egg rock from the number of sea-birds' eggs found on it; close eastward are two small detached rocks. The water is deep close-to on all sides.

Man and Wife are two rocks, 2 miles N. by E. from the north point of Great Keppel island; they are close to each other, 60 feet above high water, with deep water all round.

North Keppel Island is the second in size of the group, and is similar in formation to Great Keppel island, from which it lies N.W. 5 miles; the island is 5 miles in circumference, and is inhabited.

Sloping and Treble Islands, and Square Rocks.—These islands and rocks lie southward of North Keppel island about one mile; their shores are bold, and they require no particular description, Sloping island is so named from its shape.

Conical Rocks are a cluster of rocks or small islands $1\frac{1}{2}$ miles from North Keppel island; they complete the extreme northern range of Keppel islands.

Pleasant and Corroboree Islands lie between Conical rocks and North Keppel island; a deep-water passage exists between them, but it is not recommended.

Outer Rock lies N.E. $2\frac{1}{2}$ miles from the east point of North Keppel island; it is a bold rock, 152 feet above high water, with deep water close-to, except on the east side, which is foul a quarter of a mile off.

The Tidal Streams set along shore between Keppel isles and the mainland; the flood to the southward, and the ebb to the northward.

The COAST.—From abreast Keppel isles a low sandy shore runs northward to Water Park creek, which, with the exception of a narrow channel, of one to 2 fathoms, close to its northern point, dries at low water, and is fit only for boats. The northern side of the creek is formed by a peninsula, 270 feet high, joined to the mainland by a narrow neck, and which is N.W. 9 miles from North Keppel island. From Water Park creek a high bold coast runs North for 15 miles to cape Manifold; midway between is a bluff point, with some rocks close to the shore about a mile northward.

CAPE MANIFOLD is formed of several rocky heads with small sandy beaches between; the hills behind, from which the cape takes its

name, are 600 feet high, and increase in height south-westward to mount Atherton, of 1,480 feet, which is conspicuous from seaward (view A., chart No. 346). An island, nearly half a mile long, and 260 feet high, lies off the cape; it is slightly covered with vegetation.

Flat and Peak Islets, 175 and 400 feet high and treeless, lie respectively E. by S. 8 miles, and N.E. by E. $\frac{3}{4}$ E. 6 miles from the islet close off cape Manifold. Peak islet is perforated, and the light may be seen through it from the south-eastward.

CAPE CLINTON, N.N.W. $\frac{1}{2}$ W. $9\frac{1}{2}$ miles from the islet off cape Manifold, is the eastern point of a peninsula forming the south side of the entrance of port Bowen. From seaward it has the appearance of a bold head, the hills on it being from 400 to 500 feet in height.

Between the capes two bays are formed by Cliff point, 3 miles north-westward of cape Manifold; a sandy beach, with very low land at the back, runs 6 miles northward from Cliff point. In both these bays there is anchorage, with off-shore winds, in 6 to 8 fathoms. Double rock, 12 feet high, is N.W. by N. 4 miles from cape Manifold islet; and Single rock, which is awash at high-water springs, lies one mile north-westward of Cliff point. One and a half miles South of cape Clinton and half a mile from the shore, is Quoin islet, 310 feet high; a rock, which covers at half flood, lies 2 cables South of Quoin islet, with 10 fathoms between.

From cape Clinton a cliffy shore extends a mile north-westward to a small sandy bay, the west side of which runs out to a point, forming the north extreme of Clinton peninsula. Launch rocks, which cover at high water, are three-quarters of a mile north-westward of cape Clinton, and 2 cables from the shore.

Fresh water is plentiful close to the beach west of Cliff point, and landing is easy with south and south-east winds.

Round Islet, a quarter of a mile northward of the point just mentioned, is small and triangular at the base and is 123 feet high, with steep cliffy sides; the sea face is bold to approach, but a 3-fathoms spit projects from its north point. The islet is nearly connected with the point by a chain of low rocks.

PORT BOWEN,* a deep inlet in the mainland, can be easily distinguished from seaward, from its being nearly midway between the lofty peaked heights at the back of cape Manifold, and mount Westall 1,820 feet high, N.W. by W. $\frac{1}{4}$ W. 16 miles from cape Clinton.

The entrance lies between Round islet and a perforated rocky point which bears N.N.W. $\frac{1}{4}$ W. nearly $2\frac{1}{2}$ miles from the islet, and projects to the south-eastward from a barren hilly headland at the north end of the

* See Admiralty plan:—Port Bowen, No. 1,952; scale, $\pi = 3$ inches.

port. Port Bowen is difficult of access for large sailing vessels, on account of a bar, but inside there is anchorage, sheltered from all winds, and it is frequented by coasters during bad weather.

Entrance Island, which is small and rocky, lies nearly one mile eastward of Perforated point; it is nearly half a mile long, S.E. and N.W., and forms a good distinguishing mark for the entrance of port Bowen, as it rises to two hills 190 feet high, clothed to their summits with fine pine trees; these trees readily engage the attention of a stranger, as this is the southernmost locality along this coast where pine trees are seen.

The Bar extends from Round islet the whole way across the entrance of port Bowen to Perforated point; the southern part bends out to the eastward, and is from $1\frac{1}{2}$ to 2 cables broad. The depth of water on the bar varies from 12 to 17 feet, on a yellow, gritty, sandy bottom; but there are some very small knolls with 6, 9, and 10 feet water on them, upon which the sea breaks in a fresh breeze; in smooth water these are easily discerned by the tide rippings over them. A few detached casts of 17 feet are occasionally met with; but they must be regarded more as small furrows in the sand than as clear channels for navigation: 14 feet can only be taken as the fair average depth on the bar, at low water; the greatest depth being between a quarter of a mile and two-thirds of a mile northward of Round islet. An indentation outside the bar, immediately north-westward of the islet, affords a temporary anchorage, in 7 fathoms, where vessels may await a favourable opportunity for crossing the bar.

Eastern Shore.—On the west side of the north point of Clinton peninsula, a sandy beach extends nearly half-a-mile westward to a rocky projection, the western point of which is Inner head. The bay between Round islet and Inner head is blocked up by shoals, extending to the northward, and joining the south end of the bar.

From Inner head the eastern shore of the harbour, consisting of rocky points and sandy bays, trends about $1\frac{1}{2}$ miles southward, where a shallow muddy creek runs south-eastward into the low mangrove flat, nearly insulating Clinton peninsula. Creek and Fish rocks, which uncover at low water, extend 2 cables N.W. by W. from the second rocky point southward of Inner head.

Mount Flinders, 500 feet high, is a well-defined peak at about a quarter of a mile within the low cliff forming the north side of the entrance of the creek.

Western Shore.—The headland forming the northern side of the entrance of port Bowen consists of a mass of barren, rocky hills, sprinkled with a few stunted pine trees, the highest summit being at an elevation of 775 feet. Besides the point already described as perforated, two other

rocky points stretch out south-eastward from the base of these hills, one being two-thirds of a mile northward, and the other nearly the same distance westward of it. Perforated point and North-east point northward of it are both insulated at high water. At the head of a small cove between them, is Flinders watering-place, but it was destitute of fresh water in February 1843, and the cove afforded no good landing-place, in consequence of its exposure to the sea.

Shoal water extends south-eastward from Perforated point, forming the northern end of the bar. There is a channel about one-third of a mile broad between these shoals and Entrance island, with from 8 to 12 fathoms water, in which indifferent anchorage may be found under the lee of the island.

At about one-third of a mile south-westward of Perforated point is a small rocky islet, to the westward of which is a ledge of rocks, covered at high water.

From the westernmost of the three points a sandy beach, facing the bar, extends 3 miles southward to West point, at the back of which is a sandy plain, partially covered with scrub; the northern part of the beach is backed by a ridge of wooded sand-hills. From West point, sands covering at half flood extend S.S.E. $1\frac{1}{2}$ miles.

Black Rock is low, detached, and partly above high water; it lies $1\frac{1}{2}$ miles westward of Round islet, and N.W. three-quarters of a mile from Inner head; this rock, being situated on the eastern edge of extensive shoals bordering the west side of the port, is a good mark for clearing them.

Anchorage.—During the few days occupied in the survey of port Bowen, H.M.S. *Fly* anchored, in $4\frac{1}{2}$ fathoms, in the little bight immediately north-westward of Round islet, but this was found a very confined anchorage, and exposed to easterly winds; it is however preferable to that under the lee of Entrance island, which is not sufficiently extensive to prevent the swell meeting on its lee side.

The only secure anchorage in port Bowen is southward of Inner head, where it is well sheltered from all winds, and from the heavy swell which occasionally sets in over the bar.

Port Bowen cannot be considered a good harbour for all classes of vessels, in consequence of its barred entrance, and it is possible that the banks are of a shifting nature.

Inside the bar, the water gradually deepens towards Black rock and Inner head, but the shoal water on the west side to the southward of Black rock, contracts the channel to less than half a mile in breadth, and to little more than a cable's length abreast of mount Flinders; the channel then widens, carrying from 7 to $3\frac{1}{2}$ fathoms above 3 miles S.S.W., having a mangrove swamp on its east, and an extensive mud-flat on its western side.

Besides this arm, there are two others on the west side of port Bowen, one taking a westerly, and the other a north-westerly direction; these inlets are nearly blocked up at a short distance from their mouths by extensive sand and mud flats, and as their shores and the country to which all three of these arms lead appear to consist of mangrove swamps, mud-flats, and sandy wastes, partially covered with trees and scrub, they do not seem to merit any farther description.

Supplies.—Port Bowen, nearly surrounded as it is by a barren, sandy and swampy country, has little to recommend it except that the inner part of the port affords every facility for repairs, in the event of a vessel having sustained injury upon the reefs outside.

Excellent pine timber can be cut on Entrance island; spars are small, but bear a good strain. Wood for fuel is also abundant on the eastern shore to the southward of Inner head, as well as on Entrance island.

Water can generally be found sufficient for a small craft at the native wells near Observation rock; a surf sometimes sets in with northerly winds.

Fish are to be caught by hook and line, and on the beach near Fish rock by seine.

DIRECTIONS.—Having distinctly made out Round islet, which is close off the north point of cape Clinton, steer boldly for it, and bring Black rock in line with West point bearing W. by S. $\frac{1}{4}$ S.; a vessel will then pass at one-third of a mile to the northward of Round islet, in 8 fathoms water; the depth then quickly decreases, and on the islet bearing S.E. by E. she will be on the bar, passing at about half a cable's length southward of a 6-foot knoll (which breaks at low water) and carrying from 14 to 16 feet at low-water springs. A remarkable red sandy cliff, on the western shore of the southern arm, will now open westward of Inner head, and the water will rapidly deepen to 12 fathoms; when the vessel may be gradually hauled up for the western extreme of Clinton peninsula, which will appear as a detached rock. The remarkable red sandy cliff must be kept open westward of the point, to avoid the inner edge of the bar; and Black rock must not be brought to the northward of N. by W., as on that line of bearing is the edge of the shoals extending from West point on the west side of the harbour. Inner head and the rocky point southward of it may be passed within a cable's length, and a vessel can anchor in 9 or 10 fathoms, sand, off the sandy bay between the two points, at about a quarter of a mile from the shore. A convenient place may here be found for careening, if necessary.

The bar may also be crossed by steering for Black rock, on a S.W. by W. $\frac{1}{4}$ W. westerly bearing, passing nearly two-thirds of a mile north of Round islet, and half a cable's length southward of a 9-foot knoll, on which are strong tide rippings, and breakers at low water.

In entering port Bowen from the northward by the passage inside Entrance island, the bar must not be approached too closely before crossing it, especially during a spring flood stream, which sweeps in with great strength, and may drive a vessel upon the bar. It is recommended to steer for cape Clinton until the remarkable red sand cliff comes nearly on with Inner head S.S.W., when the bar may be crossed in 12 feet, and enter the port with that mark on until Black rock comes nearly on with West point, when proceed as already directed.

TIDES.—It is high water, full and change, in port Bowen, at 10h. 25m.; springs rise 11 to 15 feet, greatest range neaps, 12 feet. The velocity of the stream at the *Fly's* anchorage was $2\frac{1}{2}$ knots, at springs; the flood setting directly in from the eastward, and in the vicinity of Black rock towards West point sands when they begin to cover. Inside Entrance island, a branch of the flood was found setting to the northward.

The COAST.—From North-east point of port Bowen a broken shore runs northward for 2 miles to the southern point of Pearl bay; a quarter of a mile off is an islet 140 feet high, with deep water between it and the shore. From this point the coast runs westward and northward for 9 miles to Island head, which is 304 feet high, and connected to the shore at low-water springs by a sandy neck. Between Island head and the point half a mile southward of it is Island head creek, an inlet extending nearly 6 miles to the southward. About $1\frac{1}{2}$ miles westward of Island head is Pinetrees point, three small pine islets, from which the coast trends W. by N. $3\frac{1}{4}$ miles, to Reef point forming the south side of the entrance of Strong Tide passage.

Anchorage.—Vessels during strong south-east gales may find secure anchorage well out of the tide in from 4 to 9 fathoms, one mile W. by N. from Pine trees point, and two-thirds of a mile off shore, small craft can get closer in.

Mount Westall 1,820 feet high, is a conspicuous coast feature and the highest of the peninsula range between port Bowen and Strong Tide passage; these hills are steep and stony: pine trees grow in the gullies, and Captain Flinders found some fresh water in the hollows. The lower hills are covered with grass and trees, as is also the low land, although the soil is shallow and sandy.

Hervey Islands, which lie off this coast, are small and rocky, forming two groups; the southern group lies $1\frac{1}{4}$ miles North of the south point of Pearl bay, and consists of two islets and several rocks; they are remarkable from the pine trees growing upon some of them. Dome islet, the southernmost and largest, is 357 feet high, and Split islet 287 feet. A reef of rocks projects 2 cables westward from the south point of Dome islet. Clara group, the four northern islets, lie close together, the central

and largest bearing East $3\frac{1}{4}$ miles from Island head, is 155 feet high. These islets may be boldly approached from seaward, and there is deep water inside all.

Pearl Bay, westward of the southern group of Hervey islands, affords anchorage in 5 to 8 fathoms, within the line of the extreme points of the bay, with Dome island bearing about E.N.E. A group of islets, connected to the shore by shoal water, extends north-westward for one mile from the south point of the bay; between these islets and the southern group of Hervey islands is a passage nearly a mile wide of 10 to 17 fathoms.

Brown rock just above high water, lies half a mile from the coast and $1\frac{1}{2}$ miles North of Pearl bay, with deep water between it and the shore.

Tidal Streams.—The flood and ebb streams set past Hervey islands, north-west and south-east from $1\frac{1}{2}$ to 2 knots an hour.

Island Head Creek runs 6 miles southward from Island head towards port Bowen; the entrance between Island head and the point south-eastward is half a mile wide, and is obstructed by rocky shoals. Small vessels may enter the creek by keeping close along the southern shore.

STRONG TIDE PASSAGE, the entrance of which lies about 3 miles northward of mount Westall, is an opening 6 miles long and from one to 2 miles wide, leading south-westward into Shoal-water bay; but half the width is taken up by shoals and rocks, which extend from either shore, and in some places lie nearly mid-channel: these, together with the rapid streams, scarcely leave a vessel the choice of her course. The bottom is rocky in the outer entrance; but the south-west part seems more generally to consist of sand and shells. The depth in the channel is from 2 to 9 fathoms.

The tidal-streams run through Strong Tide passage from 4 to 6 knots, and on the ebb there are strong overfalls causing a heavy break at the eastern entrance. This passage is dangerous at all times, and cannot be recommended for any vessel.

CAPE TOWNSHEND, the south-eastern limit of Broad Sound channel, 6 miles north-westward of Strong Tide passage, is the north extreme of Townshend island, which is 9 miles long North and South, and 6 miles broad at its broadest part; it is high and level, and scantily covered with wood; some rocks above water skirt the cape, and lie close to the shore about a mile south-eastward of it.

Leicester Island, which is 5 miles long N. by E. $\frac{1}{2}$ E. and S. by W. $\frac{1}{2}$ W., and 2 miles broad, wooded, and is separated from the west side of Townshend island by Canoe pass, with depths of one to 5 fathoms;

but the northern entrance is only a quarter of a mile wide and quite choked by rocks.

Anchorage.—There is anchorage for small vessels, in 4 or 5 fathoms, in Supply bay, 3 cables S.W. of Cape islet, a rock westward of cape Townshend joined to the shore at low water by a ledge. When entering, vessels must guard against the tide which sets strong across the entrance. This anchorage is convenient for vessels requiring wood or water; a stream of fresh water will be found at the sandy beach immediately southward of the cape. Moderate northerly winds send no sea into the anchorage. Various kinds of vegetables have been planted near the watering place.

SHOAL WATER BAY is an extensive inlet on the south side of Broad Sound channel, the entrance of which lies between cape Townshend and Pier head, distant from each other about 25 miles W. $\frac{1}{2}$ N. and E. $\frac{1}{2}$ S. This arm of the sea runs about 30 miles south-eastward, in the direction of cape Manifold; and divides into several branches at the back of port Bowen, nearly insulating the land northward of the port.*

Ripple Islets, are a group of four small islands extending nearly 4 miles westward of cape Townshend; the largest of these islets is on the northern edge of the group W. $\frac{1}{2}$ S. 2 miles from Cape islet, and is 150 feet high, shoal water extends eastward for $1\frac{1}{2}$ miles, leaving a passage 2 cables wide leading into the anchorage south-westward of Cape islet. On the eastern part of this shoal water is a sand-bank which dries at low-water springs; a ridge of one to 2 fathoms joins the bank to the southern shore. Harrison islet, the western one, is W. by S. $\frac{1}{2}$ S. $3\frac{1}{4}$ miles from Cape islet and is 40 feet high; a rock dries at low water $1\frac{1}{2}$ cables off its west side, and a ledge of rocks runs south-eastward for nearly half a mile. There are many shoal heads between the islets, and the tide streams are very strong, with heavy tide ripples.

Cannibal Group, a cluster of islands and rocks, lying on a shallow bank about 7 miles long, East and West, and 3 miles broad, in the centre of the northern entrance of Shoal Water bay, with navigable channels on either side. Numerous rocks and islets, the largest of which Mumford and Holt islets are from 30 to 60 feet high, are scattered along the eastern edge of the bank. North rock, the northernmost, is 6 feet above high water; the eastern point of the bank is 2 miles West of Ripple islets, with depths of 12 to 20 fathoms between. Collins island, the southernmost and largest of the group is $1\frac{1}{2}$ miles long, and the tops of the trees are 120 feet high; close off the north-west part of the island are Annie and Eliza islets. Lingham island, 60 feet high, is on the western edge of the bank, and $1\frac{1}{2}$ miles from Collins island.

* See Admiralty chart:—Approaches to Shoal Water bay, No. 808; scale, $m = 0.7$ inch.

White rocks, 30 feet above water, lie N.W. $1\frac{1}{2}$ miles from Lingham island, and are detached from the bank upon which the other islands stand; ledges of rock dry northward and westward for half a mile, and a spit of not more than 3 fathoms, extends nearly across from Lingham island.

Anchorage.—There is anchorage protected against S.E. winds on the north side of Cannibal group in 9 fathoms, one mile W. by S. from Mumford islet, with cape Townshend just open south of it.

Turn Shoal, $1\frac{1}{2}$ miles W.S.W. from White rocks, has from one to $2\frac{1}{4}$ fathoms on it, and lies on the east side of North-west channel.

Donovan Shoal, N. by E. $2\frac{1}{2}$ miles from White rocks, is about $1\frac{1}{2}$ miles long N.E. and S.W., and has but one or 2 feet over its shoalest part. Mount Westall open east of Cannibal group, bearing S.E. by E. $\frac{1}{4}$ E. leads north-eastward, and Pine mountain well open west of White rocks, S. $\frac{1}{4}$ W., leads westward of the shoal.

White shoal, of $1\frac{1}{2}$ to 3 fathoms, lies nearly midway between Donovan shoal and Cannibal group, with deep water on either side.

The Eastern Shore of Shoal Water bay from the north-west point of Leicester island extends S.S.W. 4 miles, and S.E. by E. for 5 miles to the southern point of Townshend island; the west side of Leicester island is fringed with rocky ledges for half a mile, and from the south-west and south points of Townshend island two chains of rocky islets extend about 2 miles south-westward.

Triangular islands, 82 feet high, lie on the south-east side of the inner mouth of Strong Tide passage, and are connected to the shore by mud-flats. From these islands a mangrove shore, backed by the Peninsula range, extends S.S.E. for 8 miles to East creek, a narrow inlet, which, after running eastward for $2\frac{1}{2}$ miles, divides into several arms that reach within $1\frac{1}{2}$ miles of the western shores of port Bowen; depths of from 7 to 2 fathoms will be found to within a short distance of the head of the creek.

Head creek, the south-eastern termination of Shoal Water bay, extends S.E. by S. for 9 miles from the entrance of East creek to the base of the lofty hills within cape Manifold, gradually narrowing to the head, and with uneven depths of from 8 to 2 fathoms.

There is confined but well-sheltered anchorage in both Head and East creek.

This side of Shoal Water bay is fronted by rocky ledges and narrow banks, which partly dry at low water, extending from 2 to 4 miles from the shore. Earl banks, from one mile West of the south-western point of Leicester island, run south and south-eastward for 5 miles to abreast Round rock, 93 feet high, one mile West of the south extreme of Townshend island, leaving a channel of 4 fathoms between this rock and the banks

northward into Canoe pass. The western part of Earl banks, consisting of two detached ridges of sand and rock, extends South and S.S.E. for 3 miles from its northern extreme, and covers at high water. Round rock ledges, which cover at three-quarters flood, are two patches extending $1\frac{1}{2}$ miles South of Round rock; a flat with $2\frac{1}{2}$ fathoms water on it, stretches from them across the inner entrance of Strong Tide passage and joins Peninsula flats, which front the shore south of Triangular islands. From the north entrance point of East creek, East Ridge banks, a narrow shoal the greater part of which dries at low water, extends N.W. $\frac{3}{4}$ W. for 9 miles; from its western end, in $2\frac{1}{2}$ fathoms, the southern extreme of Townshend island bears N.E. by E. 3 miles. Between these banks and Peninsula flats a narrow blind lane, of from 9 to 4 fathoms water, reaches nearly to the shore.

The Western Shore of Shoal Water bay commences, as already mentioned, at Pier head, a bare round hill, 334 feet high, insulated at high water and forming the north-eastern extremity of Quail island. There is a hill similar to Pier head though higher, $1\frac{1}{2}$ miles southward of it, on the west side of Arthur point at the northern extreme of the tongue of land projecting north-westward from an extensive ridge of high hills, dividing Shoal water bay from Broad sound. The opening between Pier head and Arthur point is the east entrance of Thirsty sound.

From Arthur point just noticed, the coast, skirted by rocks, with sandy beaches between rocky heads, extends south-eastward 10 miles to Broome head, which is clifty; between the head and Macdonald point, a further distance of 5 miles, is a sandy beach fronted by some covering rocks for 2 miles South of the head. At Macdonald point the coast, receding 2 miles, trends E. by S. 8 miles to Sabina point, a rocky point, the south side of which is composed of white clay cliffs, forming West bight, the space between the two points is nearly filled up with mud flats which cover at half flood; upon the shoal ground which extends 3 miles from the northern point of the bight, are the three inner islets of Skull islands named respectively, Swan, the inner, is wooded with a round top, and 188 feet high, Sun, and Clara, and one mile northward of Clara islet is Osborn islet another of the same cluster, and ranging from 25 to 30 feet in height with bare flat tops. One third of a mile south-eastward of Sun islet, the eastern one, is Sunset rock, which covers at half flood. Three miles north-west of the eastern rocky point of West bight, is Akens island, which is 2 miles long N.E. and S.W.; the north point of the island, 121 feet high, is clifty, the other portion low and covered with scrub, it is surrounded by mud flats, with the Pelican rocks on their northernmost point, $1\frac{1}{2}$ miles W.S.W. from Master rocks, and joined at low water with those extending from the south shore of the bight. Master rocks lie one

mile North of Akens island and cover at half flood. Shoal ground with $1\frac{1}{2}$ to 3 fathoms extends from these rocks into West bight, and to within a mile of Sunset rock.

From Sabina point, the east point of West bight, the low swampy mangrove shore, intersected by several salt-water creeks, trends E.S.E. nearly 18 miles to the entrance of Head creek; this portion of the shore is fronted by mudflats, which cover at about half flood, and extend off from half to $1\frac{1}{2}$ miles.

West Bight occupies the space between Akens island and Master rock on the east, and the three inner Skull islets on the west, the entrance is between Sunset and Pelican rocks, and $1\frac{1}{2}$ miles wide; the greater portion is shoal, except a bight of from 4 to 6 fathoms extending nearly a mile south-westward from Sunset rock, where there is anchorage sheltered from all winds but those from east-south-east; small vessels may anchor half a mile West of the rock, further out of the tide.

Bay (b) and Edwards (b 1) islets, near the middle of Shoal Water bay, at the junction of North and North-west channels, lie N.E. $2\frac{1}{2}$ miles, and N.N.E. $2\frac{3}{4}$ miles from Akens island; Bryant rock lies nearly half a mile north-west of Edwards islet, and covers at half flood.

West Ridge Banks, similar in character to and parallel to East Ridge banks, extend from the south entrance point of Head creek N.W. $\frac{3}{4}$ W. 17 miles; their north extreme in $2\frac{1}{2}$ fathoms bearing East from Akens island, distant 3 miles. One mile West of the extreme of West Ridge banks, and 2 miles East of the north point of Akens island, is Connor rock which dries at low-water springs, with 4 to 9 fathoms around. Passage patch of $2\frac{1}{2}$ fathoms, lies between the north-west ends of East Ridge and West Ridge banks, S.S.W. $4\frac{1}{2}$ miles from the south point of Leicester island.

Separation bank, southward of the west part of Cannibal group, is about 3 miles in extent, with as little as 3 feet water on its western side, over other parts of the bank there are from one to $2\frac{1}{2}$ fathoms; a detached patch of $2\frac{1}{2}$ fathoms lies north-west of the bank, and S.W. nearly 2 miles from the west end of Lingham islet. Blind rock, which is small and uncovers at low water, lies nearly one mile south-east of the bank, and is N.W. by N. $1\frac{1}{2}$ miles from Edwards islet; there are from 6 to 11 fathoms in the passage between Blind and Bryant rocks. Between Separation bank and Cannibal group there is a passage half a mile wide, with 4 to 6 fathoms.

North Channel, leading into Shoal Water bay, between Ripple islets and Cannibal group, is 2 miles wide in its narrowest part, which is at the entrance; there is a small space of uneven ground, with 4 to 5 fathoms, $2\frac{1}{2}$ miles West of the south-western point of Leicester island.

The tidal streams run through the centre of this channel from 2 to 3 knots, and are weaker on the west side, but in the vicinity of Ripple islets attain a strength of 4 knots. Pine mountain well open west of Harrison islet, bearing S.W. by S. leads into the channel.

Anchorage sheltered from the prevailing S.E. winds and easy of access, may be used as a stopping place, off the west side of Leicester island, $1\frac{1}{2}$ miles from the shore in 7 to 10 fathoms, and 2 miles South of Harrison islet. With northerly winds, good shelter will be found by anchoring two-thirds of a mile South of Collins island, in from $5\frac{1}{2}$ to 9 fathoms.

North-west Channel is westward of Cannibal group, with depths of 6 to 14 fathoms; its general direction is S.E. and N.W., and in the narrowest part between Separation bank and Skull islands the channel has a width of nearly 2 miles with depths of from 6 to 9 fathoms.

Beyond Edward (b 1) islet it divides into two branches, one leading into a large blind channel between West Ridge banks and the shore; the other branch merges into North channel a mile East of Edward islet, and from this junction, with the exception of Passage patch and a small 3-fathoms knoll 6 miles further, a clear channel with from 4 to 9 fathoms leads up the bay in a S.E. $\frac{1}{4}$ E. direction between East Ridge and West Ridge banks, to within 4 miles of East creek; beyond this point, narrow but deep channels lead into East and Head creeks. These channels should be navigated while the banks are uncovered.

In the absence of buoys or well established leading marks, the chart will contain the best information for navigating the waters of Shoal Water bay.

Aspect.—The land behind the west shore of Shoal Water bay, from Thirsty sound to the northern point of West bight, is hilly and wooded; and from thence south-eastward towards the high land, which extends to the westward from cape Manifold, the country is for the most part low and woody, with detached mountains rising from the low land; of these the most worthy of notice are Pine mount, 1,213 feet high, W. by S. $\frac{1}{4}$ S. 21 miles; High Double mount, 2,545 feet high, S.W. $\frac{1}{4}$ W. 19 miles, and Hummock mount, of 1,257 and 1,433 feet in height, S. $\frac{1}{4}$ W. $17\frac{1}{2}$ miles from mount Westall.

Remarks.—No fresh water was found in Shoal Water bay unless at a distance from the shore, and then only in small quantities. In the winter season the fish are more abundant than farther south. Pine trees are plentiful, but they grow upon the stony hills at a distance from the water-side, and cannot be procured with anything like the facility offered by port Bowen. The mangroves which spread themselves from high water at neaps, up in the country to the farthest reach of the spring tides, in some

places for miles, render landing impossible in the upper parts of the bay, except at a few spots.

Natives.—The natives of Shoal Water bay, at the time of the survey had the reputation of being hostile and treacherous.

TIDES.—It is high water, full and change, in Shoal Water bay, at 11 h. 30 m. ; springs rise 19 to 22 feet, neaps 15 feet. The tidal streams run through North channel from 2 to 3 knots, and through North-west channel from 2 to 2½ knots; in the body of the bay their rate is from 1½ to 2 knots. Between Edward (b 1) islet and Akens island the stream runs north-west and south-east. The soft mud at the bottom is stirred up by the streams, and makes the water thick, as in Keppel bay.

Stanage Bay lies immediately to the westward of Bald hill. Fresh beef can be procured from the cattle station in Stanage bay; landing is easy at the south end of the beach under Bald hill.

QUAIL ISLAND, of which Pier head is the eastern point, is 6 miles long north-east and south-west, having an average breadth of 2 miles, with rocky shores and sandy bights. The highest part of the island, near the centre, is 378 feet above high water, being sparsely timbered but well grassed; the southern part is low and thickly wooded.*

LONG ISLAND is hilly in the northern portion, attaining a height of 610 feet, and 11¼ miles long nearly North and South, and 3½ miles broad; its east coast consists of rocky points and bays to where it is separated from the south-west end of Quail island by Middle passage, a channel one-quarter of a mile broad; both entrances of this channel are nearly blocked up with islets, rocks, and shoals. Beyond this to the southward, are mangroves with rocky points, and muddy bights.

The west coast of Long island consists of a succession of rocky points and small bays, the latter being filled up with mud-flats: at about mid-way is West-side islet, surrounded by a reef extending 1½ miles from the shore. The coast northward of West-side islet is tolerably high; southward of the islet the coast is low, and covered with mangrove; rocky ledges and mud-flats dry off more than a mile. Two and a half miles southward of West-side islet are some red cliffs.

Mangrove islands are five low, muddy islets southward of Long island, separated from it by a labyrinth of winding creeks amongst the mangroves, with which these muddy islets are nearly covered: they are enclosed, together with the south end of the island, by a shoal. On the south point of the cluster is a small hill, partly excavated by an arched way nearly through it, bearing S. by W. 2 miles from the south extreme of Long island.

* See Admiralty chart :—Approaches to Broad sound, No. 807; scale, $m = 0.7$ inch.

Dangers off west side of Long Island.—Gannet rock, which covers at three-quarters flood, lies W. by S. $1\frac{1}{2}$ miles from North point Long island; shoal water extends half a mile north-eastward, and one-third of a mile north-westward of the rock. Comet rock, covering at half flood, is $1\frac{1}{2}$ miles southward of Gannet rock, and two-thirds of a mile from the shore. Comet ledge is a narrow sand-bank, covering at half flood, extending $3\frac{1}{4}$ miles southward from Comet to Tail rock, nearly parallel to the shore; between the ledge and the shore are depths of from $4\frac{1}{2}$ to 6 fathoms, which continue to a little southward of West-side islet, in the north part of this vein of deep water is Burkitt road. About three-quarters of a mile westward of Comet ledge are several spots of $1\frac{1}{4}$ and 3 fathoms, farther out is another of $3\frac{1}{4}$ fathoms which lies N.W. 3 miles from West-side islet.

Boyle reef lies close to the north-west of West-side islet; a little distance off the western side of the reef is the northern end of the Connor banks, which dry at low water and extend to $3\frac{1}{2}$ miles to the southward, the southern and outer of these banks is $2\frac{1}{2}$ miles from the shore. Long bank, covered at half flood, slightly overlaps the south end of the Connor banks, at nearly a mile outside; it is narrow, $5\frac{1}{2}$ miles long, and extends parallel to the shore from which it is 3 miles distant.

Caution.—The southern portion of the above dangers have deep water close outside them, they must therefore be approached most cautiously.

THIRSTY SOUND, the narrow strait separating Quail and Long islands from the mainland, received its name from Captain Cook, who was unable to discover any fresh water there, in May 1770. It is 12 miles long from Pier head to the excavated hillock on Mangrove islands just described, and is from half a mile to $1\frac{1}{2}$ miles wide.

In the eastern part of Thirsty sound, about a mile within Pier head, anchorage will be found in $3\frac{1}{2}$ to 6 fathoms, but north-east and easterly winds cause a swell. From the anchorage the deep-water channel rapidly contracts, and in the narrow part of the sound $2\frac{1}{2}$ miles south-westward of Pier head, the tidal streams run from 4 to 6 knots. From this point to the western entrance, southward of Mangrove islands, the channel is narrowed by sand and mud flats, and the depths are from one to $2\frac{1}{2}$ fathoms. The tidal streams meet on the east side of Mangrove islands.

A vessel damaged by grounding and unable to reach port Bowen, could be beached for temporary repairs on the flat inside Pier head.

Double Rocks lie one mile North of Lucy Ravel point, Quail island; they cover at springs.

Sand-bank Bay, formed between the Barren islets and the shoals westward of them, and the northern shores of Long and Quail islands, has

the greater portion of the southern part filled up by shoals and uneven depths of water.

Barren Islets are two in number, 112 and 121 feet high, lying N.W. 4 and $5\frac{1}{4}$ miles from Pier head. Shoal water extends $1\frac{1}{4}$ miles westward of the southern islet, nearly meeting the Obstruction shoals which also extend to the westward towards North point of Long island, and only leaves a very narrow passage into Sand-bank bay. Brooks shoal extends westward of the northern islet, having from one to 7 feet on it, and the extreme is $2\frac{1}{4}$ miles W. $\frac{3}{4}$ N. from the islet.

Pearl Pass lies between the shoals westward of the north and south Barren islets, it is about 3 miles long, from a half to one mile broad, and has a depth of from 5 to 7 fathoms water.

Black Swan Rock, covers at half flood, and is E. $\frac{1}{4}$ S. nearly $1\frac{1}{4}$ miles from the north Barren islet. Wild Duck island open north of Barren islet West, leads north of the rock, and west point of Wild Duck island on Cliff head, open south of Barren islet W. $\frac{3}{4}$ N., leads south of the rock, *see* views B. and A., chart No. 807.

BROAD SOUND is an arm of the sea running south-eastward into the mainland westward of Long island; its entrance lies between North point, the northern extreme of Long island, and West hill, a remarkable mount, W.N.W. 26 miles from North point. Depths of from 11 to 6 fathoms will be found over a large portion of the sound, but the head and eastern shores are obstructed by extensive flats and shallow banks.

The stone of Upper head, and apparently of all the hills in its neighbourhood, is granitic; whilst that of Long island and West hill approach nearer to porphyry.

NORTH POINT ISLANDS are a cluster of islands and rocks, at the entrance of Broad sound, north-westward of Long island. Wild Duck island, the largest, a double island with a fresh-water lake on the low land in its centre, lying N.W. $3\frac{1}{4}$ miles from North point of Long island, is 2 miles long, and 367 feet high at its western part. Bush islet, 30 feet high, lies East half a mile; and Channel islet, 40 feet high, N.N.E. $1\frac{1}{4}$ miles from the island. The space between the two islets is nearly filled up by Park shoal, which extends $2\frac{1}{4}$ miles eastward of Wild Duck island; the shoal has from one to $2\frac{1}{4}$ fathoms on it, and from 5 to 6 fathoms close outside. Nearly $2\frac{1}{4}$ miles N.E. by E. of the extreme of Park shoal is Half-tide rock, the passage between, extending to cape Townshend, is named Broad Sound channel. The west side of Pier head just open eastward of North Barren island S.E. $\frac{1}{4}$ S. leads between Park shoal and Half-tide rock, *see* view C, No. 807. Falcon islet, 100 feet high, from which a sand-spit and foul ground extend south-westward nearly a mile lies North, half a mile from the north-east point of the island. From the west point of Wild

Duck island a reef of rocks, partly awash at high water, extends northward for one mile. South-westward of the islets are North point cays, detached banks of sand and stones which uncover from half ebb to low water, and extend 4 miles; upon this shoal are the three Infelix islets from 15 to 40 feet high, lying N.W. and S.E. The east side of George island open west of Turn island, North, leads west of North Point cays; *see* view F., chart No. 807.

Turn Island, the western of North Point group, is W. by N. $1\frac{1}{2}$ miles from the west point of Wild Duck island; it is $1\frac{1}{2}$ miles long and 280 feet high. Holt shoal, which dries in parts, extends N.E. $1\frac{1}{2}$ miles from the west end of Turn islet. The summit of Tinonee (High) Peak island in line with the west side of George island N. $\frac{1}{2}$ W., leads west of Holt shoal; and with Barren island just open north of Falcon islet S.E. by E. $\frac{3}{4}$ E., leads half a mile north of it; *see* views E. and G, chart No. 807. Race pass is a deep and clear passage, between Wild Duck and Turn islands, but the approaches are obstructed by the dangers just mentioned, and the tidal streams run through with considerable velocity.

Sandy Shoals, East $2\frac{1}{2}$ miles from West hill, are $2\frac{1}{2}$ miles in extent with $1\frac{1}{2}$ fathoms over the shoalest parts; 4 fathoms will be found between the shoal and the shallow water fronting the shore southward of West hill.

Alexandra Reefs, are within the depth of 2 fathoms, $2\frac{1}{2}$ miles long N.E. and S.W.; near the south-western part of the reef is a patch of rocks which cover at half flood. Avoid isle just open west of Red clay isle, leads westward of Alexandra reefs. Red point, Avoid isle, open east of Red clay isle, leads east of the reefs; *see* views L. and M., chart No. 807.

FLAT ISLES, on the western side of Broad sound, extend over a space of nearly 14 miles North and South, and about 7 miles East and West, and are all wooded. Red clay isle, the northernmost, is W. by N. 9 miles from Turn islet, and S.E. by E. $\frac{1}{2}$ E., 10 miles from West hill, and is about 80 feet high; Drumfish shoal of $2\frac{1}{2}$ fathoms lies one mile off the north-west side of the islet, and foul ground extends $1\frac{1}{2}$ miles off the north-east end.

Avoid Isle, 110 feet high, is S.S.E. $1\frac{3}{4}$ miles from Red clay isle; the space between is almost entirely occupied by the Beware rocks, which cover at half flood, and shoal water. Close off the south end of Avoid isle is Little islet, 20 feet high. West reef, which shows at very low springs, extends $1\frac{1}{2}$ miles to the eastward from the Beware rocks and Avoid isle, to which its southern part is almost joined. South side of West hill open north of Red clay isle W. by N. $\frac{3}{4}$ N. leads north of West reef; and Roundish islet open south of Little islet, S.W. by S. leads east of it, *see* views K. and I., chart No. 807.

Middle Shoal, nearly 2 miles long N.E. and S.W. and very narrow, lies E.N.E., 3 miles from Avoid isle, and has 2 fathoms on its shoalest

part. The summit of High peak (Tinonee) islet in line with the west side of Innes islet N. $\frac{3}{4}$ E., leads east of Middle shoal, *see* view H., No. 807.

Aquila Islet, 4 miles West of Avoid islet, is 80 feet high and the largest of the group, being $1\frac{1}{2}$ miles long: a rock 20 feet high lies $1\frac{1}{2}$ miles off its north end. Roundish islet is small, 121 feet high, and lies S.E. 5 miles from the south point of Aquila islet; several detached rocks and sand-banks lie between the two islets. A sand-spit, which covers a half flood, beyond which the Tornado rocks, which cover at high-water neaps, and Gull cay awash at high springs, project North for $3\frac{1}{2}$ miles from Roundish islet, leaving between them and the uneven ground extending three-quarters of a mile from Avoid islet, a clear 7 fathoms passage one mile wide.

Flock Pigeon isle, $4\frac{1}{2}$ miles South of Roundish isle, lies parallel to the adjacent shore, from which it is distant $1\frac{1}{2}$ miles. Between Roundish and Flock Pigeon isle is the Rat tail sand, which uncovers at low-water springs; and the latter isle is nearly joined to the shore at low water.

The Eastern Shore of Broad sound has already been described as the west coast of Long island as far as the southern entrance of Thirsty sound, *see* pages 154, 155. At $3\frac{1}{2}$ miles southward of the red cliffs on the east side of this opening is a shallow creek, taking an easterly direction; its entrance is nearly one mile wide, but neither of the two arms into which it branches extends more than 5 miles inland. The creek is nearly filled up with mud, which dries at low water, and the shores are covered with mangroves to a great extent; even Island bluff, a cliffy head on the north point of the entrance, appeared to be isolated at high water. A narrow channel leads into the mouth of the creek, through the mud-flats which extend north-westward from the swampy mangrove shore; but the channel at low water is too shallow for anything larger than boats.

Charon Point, S.W. by W. $6\frac{1}{2}$ miles from the entrance of the creek at Island bluff, forming the northern termination of the range of hills between Styx river and Herbert creek, mount Phillip, the highest, being 1,250 feet above the sea.

From between Island bluff and Charon point, the inner part of Broad sound, known as Herbert creek, runs into the low land, about 20 miles, in a south-easterly direction, when it becomes contracted to a creek barely half a mile wide. The shores on both sides are low and muddy, intersected by creeks, and overgrown with mangroves. A sand and mud flat extends nearly half way across from the creek, near the south entrance of Thirsty sound, towards Charon point, the north-west side of which branches into spits running out from 4 to 5 miles from the shore. There are irregular soundings of $1\frac{1}{2}$ to 5 fathoms across these spits, from Thirsty sound to Charon point.

Upper head, $1\frac{1}{2}$ miles S.E. of Charon point, and another projection $2\frac{1}{2}$ miles south-eastward of it, are steep-to, with anchorage off them, in 3 to 4 fathoms, at under one mile from the shore, the former head affording a convenient landing-place; but immediately southward of the latter a mud-flat extends off shore, nearly meeting, four miles farther up, the flat stretching out from the opposite shore. The arm above this becomes so completely filled with quick-sand flats as scarcely to afford a channel for boats.

Western Shore.—From West hill, a low, woody shore fronted by sand and mud flats, trends S. by E. $\frac{1}{2}$ E. 21 miles, to Clairview bluff, a point at the south-east termination of a coast range of moderate height, and also forming the north side of a shallow opening, named Clairview creek. Between this opening and Charon point, a distance of 18 miles, the shore is very low and covered with mangroves, and intersected by four large but shallow openings, named St. Lawrence and Waverly creeks, Hoogly and Styx rivers.

From the western side of Broad sound, between West hill and the mouth of Styx river, sand and mud flats, and shallow water, extend from one to 3 miles, preventing landing except near high water.

St. Lawrence Creek.—One mile South of North Red bluff, and 6 miles from Clairview creek, is South Red bluff the north-western entrance point of St. Lawrence creek, upon which is situated the township of St. Lawrence, about 6 miles from the sea. The greater part of the creek is dry at low water, leaving a very narrow and shallow passage between the sand-banks which shift, more or less, with each spring tide. The channel of the creek is buoyed, and upon Rocky islet, at its mouth, is a small white beacon. Near the pilot station is a pool, known as The Basin, in which there is a depth of 9 or 10 feet at low water. No stranger should go above the Fairway buoy without a pilot, and should a vessel be unable to reach the Basin, care must be taken to ground on an even keel in the direction of the channel, as the tidal streams at springs run with considerable velocity; the strength of the flood runs into The Basin, and the ebb northward of Mangrove island, the flood runs 4 hours and the ebb 8 hours.

Pilots.—The pilot station is on the south side of the creek, near The Basin. The pilots board vessels off the Fairway buoy at the entrance of St. Lawrence creek.

Light.—A *fixed* white light is shown from a flagstaff at the pilot station in St. Lawrence creek.

Waverley Creek, is 5 miles south-east of the entrance of St. Lawrence creek, of which it is the port; upon the bar at the mouth there is a depth of 3 feet at low water, and inside there is good anchorage for

small vessels, in 12 feet, sheltered by the bar without. The government wharf is a mile nearer the township than The Basin in St. Lawrence creek. Small craft can lie alongside the wharf on oozy clay in 4 feet at low water; larger vessels have to lie about 20 feet off, in from 6 to 7 feet.

The Hoogly, is a creek, about 2 miles East of Waverley creek, running south-eastward between low mangrove shores for 6 miles, where it joins Styx river which empties itself into Broad sound, by an entrance 2 miles wide, immediately west of Charon point. The greater part of these inlets is nearly blocked up by mud-flats, and the borders are covered with mangroves. Turtle islet lies at the entrance of Styx river 2 miles north-west of Charon point.

Buoy.—A red and black chequered buoy is moored in 4 fathoms water, $2\frac{1}{2}$ miles from the shore between St. Lawrence and Waverley creeks.

Caution.—There is a short sea and strong tide at the Fairway buoys off St. Lawrence and Waverley creeks; vessels, if able to proceed, should not remain there.

Crocodile Banks, near the head of Broad sound, are two ridges of sand which partly dry at low water, running nearly parallel to each other in a N.W. and S.E. direction for nearly $3\frac{1}{2}$ miles, and separated by a passage with a depth of 4 fathoms; the southern edge of the banks is North $3\frac{1}{2}$ miles from Charon point. Between Crocodile banks and Turtle islet off the mouth of Styx river, there is a channel, leading to Upper head, $1\frac{1}{2}$ miles wide, with depths of 4 and 5 fathoms; and eastward between the banks and the spits stretching from the east side of the sound, is a passage one mile wide, with 5 and 6 fathoms.

One Fathom patch is a bank about one mile long, lying north-westward of Crocodile banks, with 4 fathoms between; from the shoalest part, the red cliff on Long island bears N.E. $\frac{1}{2}$ E., distant $7\frac{1}{2}$ miles, and the facing part of Upper head S.S.E. $\frac{1}{2}$ E. $7\frac{1}{2}$ miles.

A bank of $4\frac{1}{2}$ to $4\frac{3}{4}$ fathoms lies north-eastward 6 miles from North Red bluff.

CHANNELS.—Of the several passages or channels leading from the northward into Broad sound, the West, between the land and Flat isles, and Flat island pass, between the Flat islands, cannot be recommended, and should not be taken by a stranger. Main channel, between Flat, and North Point isles, is the widest and most direct, being, between Middle shoal and Turn islet, $4\frac{1}{2}$ miles wide, with 10 and 11 fathoms water. North point passage, the eastern channel, is between North Point islands and North point of Long island, its general direction being N.E. and S.W.; the narrowest part of the channel is $1\frac{1}{2}$ miles wide, between the foul ground of North Point cays, and that on the eastern side of the channel,

extending from Gannet rock. Chammel islet, its breadth open east of Wild duck island, leads between the Gannet rock and North Point cays; *see* view D., No. 807. The passage through Thirsty sound should never be attempted by any but small vessels thoroughly acquainted with the locality.

Anchorages.—The best anchorage on the west side of the sound and out of the tide, is one mile north-west of Aquila island, with shelter from all but North and N.E. winds; there is anchorage at $1\frac{1}{2}$ miles N.E. of Flock Pigeon island to the east of Rat Tail sand; it is apparently exposed, but the tide is weak and the sea more regular than elsewhere; and anchorage will be found by small vessels, during east and south-east winds, close under the north-west side of Flock Pigeon island about 2 cables from the shore, but the place is difficult of access; also west of Roundish islet, in from 5 to 7 fathoms, the anchorage is confined, but the tide is weak, South and S.E. winds cause a sea; and also between the spit extending from Turtle islet and the shoal fronting the mainland, there is anchorage in 6 fathoms. Any vessel may anchor off Upper head and lie there in perfect safety from all winds, at two-thirds of a mile off; but cannot go higher up the sound without risk of grounding on the banks.

The best anchorage on the east side is about a mile S.S.W. of Cornet rock in 6 to 8 fathoms, half a mile outside of Cornet ledge, or closer in if possible, as the tide is little felt, and there is never much sea. Vessels visiting the sound should be provided with good ground tackle.

Landing.—From half flood to half ebb, landing is easy at Upper head, and it is perhaps the sole place on the main possessing that advantage; everywhere else the shore is very low, fronted with mud-banks, and covered in some places miles deep, with interwoven mangroves, amongst which the tide flows at high water.

WATER.—"Fresh water was scarce at this time (September 1802). "There are kangaroos in the woods, but not in numbers. The shoals all "over the sound are frequented by flocks of ducks and curlews. Many turtle "were seen in the water about Long island." *

Fresh water can be obtained from the lagoon on Wild Duck island, but the locality is a dangerous one for large sailing vessels; the best place for anchoring is off the beach on the north-west side; also, but not permanently, from the swamps on Avoid and Flock Pigeon islands; and at the township of St. Lawrence, where a few other supplies can be had.

TIDES.—It is high water, full and change, at the pilot station, St. Lawrence creek, at 11h. 50m., springs rise 20 feet. The flood stream runs for $3\frac{1}{2}$ hours and the ebb $8\frac{1}{2}$ hours. And at the south-western entrance of

* Captain Flinders' *Terra Australia*, vol. ii. p. 70.

Thirsty sound, at 11h. 50m.; springs rise 30 feet. The strength of the tidal streams is from $2\frac{1}{2}$ to 3 knots, in the channels leading into Broad sound. On the western side of the sound, the flood stream runs nearly an hour after high water by the shore.

At the entrances of St. Lawrence and Waverley creeks, the tide rises very fast, sometimes as much as 13 feet in the first hour.

In July, August, and September the night tides were from 2 to 4 feet higher than the day tides, but in October and November it was exactly the reverse.

DIRECTIONS.—Approaching Broad sound, attention to the chart and a careful look-out must be kept for the numerous rocks and dangers which lie off its entrance, and due allowance should be made for the set of the tidal streams. Bound for the settlement at St. Lawrence creek, by North Point passage, steer from the vicinity of Low islet, page 168, W. $\frac{1}{4}$ N. for the centre of Wild Duck island, keeping that island well open north of Barren island, to clear Black Swan rock, *see* view B., chart No. 807, continue this course, passing three-quarters of a mile north of Barren island, to guard against the flood which sets strong over Brooks shoal, until the west side of North Point island bears S.S.W. $\frac{1}{4}$ W.; a vessel will then be clear west of Brooks shoal, and may steer S.W. $\frac{3}{4}$ W. in mid-channel through North Point passage until Channel islet comes its breadth open east of Wild Duck island N. by E. $\frac{1}{4}$ E., *see* View D. Keep this mark on and steer S. by W. $\frac{1}{4}$ W. until the west end of Turn island opens west of all the Infelix islets about N.W. $\frac{1}{4}$ N., when a S.W. course for 17 miles will lead across the sound to 2 miles northward of the Fairway buoy of St. Lawrence creek; the buoy may then be steered for.

Entering by Main channel, when midway between North Point islands and Middle shoal, *see* page 160, Flat isles, steer S. by W. $\frac{1}{4}$ W. for 20 miles, which will lead up to the Fairway buoy; this course passes about one mile westward of the $4\frac{1}{2}$ -fathoms bank, lying north-eastward 6 miles from North Red bluff.

Flat island pass should not be attempted by a stranger unless the clearing mark to lead west of Alexandra reef, *see* view I., chart No. 807, is well made out, and Gull cay seen, which it generally can be as it seldom covers, before getting abreast of Red Clay island. Gull cay can be approached to half a mile on its eastern side.

Beating into Broad sound, which is only recommended through the Main channel, vessels should work east of Middle shoal, *see* view H., so as to avoid the dangers off Flat islands. When beating out, the same rule should be observed, and when approaching North Point cays keep Bedwell group well open west of Turn island, *see* view F., chart No. 807, as the ebb stream sets strong towards the cays.

In fine weather, when waiting for pilot or tide, vessels can anchor a short distance north-westward of the Fairway buoy in from $4\frac{1}{2}$ to 5 fathoms.

The sand-banks at the entrance of St. Lawrence creek, which can be seen from the anchorage at the Fairway buoy, should be nearly covered before attempting to enter the creek; and when the white beacon on Rocky islet is awash there will be 8 feet over the flats. In entering, red buoys must be left on the right, and black buoys on the left.

By Night.—On nearing the entrance of St. Lawrence creek at night, vessels should not stand into less than 5 fathoms at low water. When the light at the pilot station is seen, steer for it on a S.W. $\frac{1}{2}$ W. bearing until Salt hill, which can generally be distinguished, bears W. $\frac{1}{2}$ S., and anchor in 5 fathoms at low water, in this position close to the north-west of the Fairway buoy.

WEST HILL, see pages 156, 165, is a remarkable, detached woody mount 983 feet high, and is very conspicuous when sailing along the coast: it is separated from the low mangrove of the mainland by a shallow boat channel, with a creek running to the westward, which dries at low water. The hill, which is wooded to its summit, slopes down on its western side to some rich forest land; the sea-face is formed of low rocky cliffs, with 3 and 4 fathoms water at one quarter of a mile distant.

Water.—In March 1843, H.M.S. *Fly* procured water in abundance, in pools close to the shore, and running down to the beach on the northern side of West hill: landing can be effected near the watering-place, and notwithstanding the inconvenience of rolling casks over the sands at low water, easily obtained 50 tons of water in 6 days, though lying at anchor 3 miles distant. In August 1874, there was very little water.

Caution.—Great caution is recommended when going into the woods, or where the jungle is thick, as large snakes are very numerous.

Sandy Shoals.—About $2\frac{1}{2}$ miles East of West hill are the Sandy shoals, $2\frac{1}{2}$ miles long, N.E. by N. and S.W. by S., and nearly half a mile broad: there is from $1\frac{1}{2}$ to $2\frac{1}{2}$ fathoms over them.

BEDWELL GROUP are a cluster of four small islands, with bare summits, and some rocks lying close together, about E. $\frac{1}{2}$ N. 17 miles from West hill; the islands are from 100 to 400 feet high, the largest being the highest.

From Innes island, the north-western of the group, Ethel sand, which dries at one part near the island, extends $3\frac{1}{2}$ miles to the south-west. Between Ethel sand and Heath shoal, with 3 feet on it, which extends 2 miles south-westward of Poynder island, the centre and largest of the

islands, is a channel with from 7 to 20 fathoms in it. Calliope island is almost joined to the south end of Poynder island by a sand-bank. George island, the eastern one, is one mile eastward of Poynder island, the channel between being nearly filled up by shoal water and a rock 80 feet high.

Emily Shoal.—A line of shoal heads with deep water between and terminating in 5 fathoms, extends N.E. by N. $9\frac{1}{2}$ miles from Innes island; the least depth is only 2 feet water at 7 miles from Innes island. Lake shoals, with from $2\frac{1}{2}$ to 4 fathoms and deeper water between, are narrow and nearly 5 miles long E.N.E. and W.S.W.; the west end lies S.E. $\frac{1}{2}$ S. $4\frac{1}{2}$ miles from Calliope island. Several other spits of $3\frac{1}{2}$ fathoms extend nearly 2 miles eastward of Lake shoals.

Caution.—Vessels going to West hill for water or other purposes should proceed with great caution in this neighbourhood, as the examination of the shoals is not complete.

CONNOR ISLET, N.E. $\frac{1}{2}$ E. $11\frac{1}{2}$ miles from West hill, is 200 feet high and the largest of a cluster of small rocky islets, between which and Bedwell group are Middle and Lower rocks, two dangerous patches, barely covered at high water; the former lying S.E. $1\frac{1}{2}$ miles, and the latter S.S.E. $\frac{1}{2}$ E. $4\frac{1}{2}$ miles from Connor islet. A shoal which breaks is said to extend one mile south-westward from the islet. Shag rock, which is awash at high water, is W.S.W. 4 miles from Connor islet; between the rock and Middle rock are patches of from $2\frac{3}{4}$ to $4\frac{1}{2}$ fathoms, and but $2\frac{1}{2}$ fathoms one mile West of it. Two miles S.W. from Shag rock is a shoal of not more than 3 feet, lying within the 5-fathoms line on the west side of Broad sound.

Ridge Islet, bare and 70 feet high, is N.W. by N. 3 miles from Connor islet.

Edward's Shoal is a narrow sand-bank, steep-to, upon which the sea breaks occasionally. The summit of Ridge islet bears from the north end S.W. by S. distant $2\frac{6}{10}$ miles; and from its south end S.W. by W. $\frac{3}{4}$ W. more than one mile. At about the middle of the shoal there is at low-water springs a depth of 6 feet, with 9 feet on either side for a distance of half a mile.

Yaralla Shoal is a long narrow shoal of fine sand, steep-to, with 10 feet on its shoalest part, which lies 4 cables from its northern extremity. The summit of Ridge islet bears from the north end of Yaralla shoal S. $\frac{1}{4}$ E. distant $6\frac{1}{2}$ miles; and from the south end S. $\frac{3}{4}$ E. 4 miles.

Clearing Mark, the summit of Constance islet kept just open of Granite island (Beverley group), bearing N. $\frac{1}{2}$ W., leads in mid-channel between the Yaralla and Pearl shoals. See page 169.

A shoal, on the south end of which there is a depth of 15 feet, lies N. $\frac{1}{4}$ W., $9\frac{1}{4}$ miles from the summit of Ridge island. The position of its northern end and the least water upon it have not yet been determined.

The COAST from West hill trends N. by W. 18 miles to cape Palmerston, and consists of rocky points and sandy bays, the shores of which are low, mostly covered with mangroves, and fronted by extensive sand-flats. Some grassy eminences border the coast, of which Green hill, N.N.W. 9 miles from West hill, is the most conspicuous. Several creeks running in from the bays have a pleasing appearance at a distance, but are very deceptive, as they are nearly dry at low water. Five miles East of Green hill a narrow ridge, of from one to $2\frac{3}{4}$ fathoms, and 4 miles long, extends parallel to the coast. Temple islands, a small cluster of islets and rocks, lie S. by E. $4\frac{1}{2}$ miles from cape Palmerston, and the points of the coast are skirted with rocks, but the shore may be approached within 5 or 6 miles in $3\frac{1}{2}$ to 6 fathoms; the lead, however, should be carefully attended to, and a good look-out should be kept from aloft for the outlying patches.

Aspect.—The mainland abreast of West hill, at the back of the mangroves which fringe the coast, is an open country with good soil, and in many places much furrowed by rains. The land is lightly timbered with gum trees, and produces luxuriant grass, extending to some low ranges of hills.

Mount Funnel, N.W. by N. $13\frac{1}{2}$ miles from West hill, is a remarkable mountain, 1,190 feet high; it derives its name from its summit resembling an inverted funnel; it has been distinctly seen at the distance of 42 miles.

Long hill, W. $\frac{1}{2}$ N. 12 miles from mount Funnel, is 2,330 feet high: two ranges descend from it, one, which is partially wooded, southward towards the back of West hill, and the other in the direction of cape Palmerston; the latter is bare of trees near the cape, and although stony is covered with grass.

CAPE PALMERSTON is a bluff, rocky headland about 300 feet high, and on its extremity was a remarkable overhanging tree. A low ledge of rocks, some above water, with stunted mangroves growing on them, extends $1\frac{1}{2}$ miles to the northward and westward from the cape.

NORTHUMBERLAND ISLES are a group of numerous islands of various sizes, forming the northern side of Broad Sound channel, and extending from 12 miles north-eastward of cape Townshend, to about 18 miles N.N.E. of cape Palmerston. As but few of these islands have been minutely surveyed, and as the waters between them have only been

partially sounded, any deviation from the tracks laid down on the chart will require especial vigilance.

Cheviot Island, the south-easternmost of Northumberland isles, is N.E. 12 miles from cape Townshend, and is 307 feet high; two small rocks lie off its north point, and the island is surrounded by deep water.

High Peak Island, about one mile long North and South, and half a mile wide, is 18 miles N.N.E. $\frac{1}{2}$ E. from cape Townshend, and 7 miles North of Cheviot island; there is a small sandy bay on its west side. The island, on its eastern side, rises to a peak 718 feet high; two detached rocks lie off the east side, off the north point are two rocks 20 feet high.

Goats were placed upon this island in 1872, with the view of possibly affording subsistence for any shipwrecked crews.

Between High peak and Cheviot islands, are Berwick, Tweed, and Rothbury islands, which are small and from 40 to 222 feet high. From Rothbury, the southern island, a reef with a detached rock on it, extends southward one-third of a mile.

Morpeth island is 5 miles W.S.W. of High peak, and 110 feet high; a rock, nearly awash at high water, lies about one-quarter of a mile off its north extreme.

Steep Island, N. by W. $\frac{3}{4}$ W. 10 miles from cape Townshend, is steep-to, 409 feet high and covered with pine trees, N. $\frac{1}{2}$ E. $5\frac{1}{2}$ miles from Steep island is Low rock, 10 feet above water, and which is dangerous to ships passing near in the night. Hannah rock, a reported danger of 4 fathoms, is placed $2\frac{1}{2}$ miles N.W. of Low rock.

Alnwick Island, the easternmost and highest of a cluster of four, rises to a peak 484 feet above the sea; it is nearly $3\frac{1}{2}$ miles N.W. by W. from Steep island; the remaining islands of the cluster, of which Shields island, 190 feet high, is the northern, and Hexham island, 353 feet high, the south-western, occupies a space less than 2 miles in extent. Allandale island, 102 feet high, southward of which is a small rock, is $1\frac{1}{2}$ miles North of the cluster, with 12 to 16 fathoms between.

Otterbourne Island, 204 feet high, is 3 miles W.S.W. of Hexham island, and is one mile in length. Table rock, nearly half a mile south-eastward of the island, is almost awash at high water; a reef extends half a mile East from the rock. From Otterbourne island uneven ground stretches 3 miles in a N.E. $\frac{1}{2}$ E. direction, upon the middle of which is Payne shoal, of not more than 2 fathoms. Notch mountain in line with the summit of cape Townshend, bearing S.E. $\frac{1}{4}$ S., leads midway between Payne shoal and Hexham island; and the summit of High peak island seen nearly midway between the group and Steep island, bearing N.E. by

E. $\frac{3}{4}$ E., will lead southward of all the dangers off Otterbourne island. See Clearing Marks, chart No. 346.

Marble Island, the largest and south-eastern of a chain of small islands (Duke chain) running N.W. and S.E. for 6 miles, is N.E. $\frac{1}{2}$ N. 9 miles from Pier head; the island is 2 miles long N. by E. and S. by W., and from one to 2 miles broad, and 484 feet high.

Water has been found by digging wells; wood is plentiful on the low land; and there are wild goats on the island.

Anchorage.—There is anchorage in 6 fathoms, South of Iron islet in the north part of the bay forming the great portion of the west side of Marble island, but the approaches are rather intricate, and a shoal of $2\frac{1}{2}$ fathoms partly fills up the south side of the bay. The best approach is from the westward along the north side of Tynemouth island, but it is only recommended to vessels visiting these islands.

Tynemouth Island lies $1\frac{1}{2}$ miles westward of Marble island, from which it is separated by a passage of from 7 to 12 fathoms. Off the east side is a small islet.

Bamborough Island, is the north-western of the chain stretching north-westward from Marble island, and is about one mile long North and South, and half a mile broad; the island is surrounded by a reef, which on the west side extends one mile off, on the south end of the reef is Coquet rock, 40 feet high. About one mile E. by N. $\frac{1}{2}$ N. of the north end of the island is Bamborough shoal, on which the least water found was $2\frac{1}{2}$ fathoms. Bellingham sand, uncovering at low-water springs, lies $1\frac{1}{2}$ miles westward of Bamborough island; it is 2 miles long N.E. and S.W. and about half a mile broad; there is a narrow deep-water passage between it and the reef off the island.

Between Bamborough and Marble islands are 5 smaller islands, connected by rocky ledges at low water, and fronted to the westward by the Crooked sands and shoal water, which extend nearly $2\frac{1}{2}$ miles off. The south extreme of Hunter island, the south-easternmost, lies between the north-western points of Marble and Tynemouth islands.

On Marble and Hunter islands are quarries of fine white marble which have been worked. Iron islet is composed chiefly of iron ore.

Danger Island, a small islet half a mile South of Marble island, from the islet a shoal extends westward one mile across the passage between Marble and Tynemouth islands.

Long Shoal, from half a mile south-east of Marble island, extends N.E. by E. for 3 miles; the least water on the shoal is about one foot, at nearly one mile from its western extremity.

Clearing Marks.—The east side of Townshend island just open west of Otterbourne island S.E. by E., leads east of Long shoal. Steep island open south of Table rock E. $\frac{3}{4}$ N. leads well south of Long and Danger shoals. See chart No. 346.

Osprey rocks, just above water, are one mile N.E. of the north-east end of Marble island; and Jeffreys rocks, 50 feet high, are N.E. by N. 4 miles from the same island. One third of a mile north-east of the north end of Hunter island is Till rock, awash at low water, and a little farther out in the same direction is the Till shoal, with $1\frac{1}{2}$ to $2\frac{1}{2}$ fathoms on it.

Lola Montes Pass, between the north-west end of Marble island and Hunter island, is very narrow, and the tide runs from 3 to 5 knots through it. Strangers are not recommended to use it, except in cases of emergency.

Low Islet, which is 6 feet above water, is one mile S. by E. of Two Round rocks, and 5 miles N.E. by N. from Pier head. Two Round rocks, 72 and 60 feet high, lie upon a patch of foul ground $2\frac{1}{2}$ miles S.W. by S. from Tynemouth island.

Boomerang Shoal is a narrow ridge extending W. by S. 10 miles from Bamborough island; the least water on the shoal is $1\frac{1}{2}$ fathoms, and the tide causes strong ripples over it. There is a narrow passage between the east end of the shoal and the Bellingham shoal.

South Sail Rock, 8 feet high, is N. by E. 4 miles from the north point of Bamborough island. Sail rock, just above high water, is $3\frac{1}{2}$ miles N. by E. $\frac{1}{2}$ E. from South Sail rock; both these rocks are steep-to.

h.h. or Guard fish Cluster, consists of a number of islets and rocks occupying a space extending 7 miles North and South, and 5 miles broad. This cluster should not be approached within 4 miles.

h. l. or Douglas islet, the south-westernmost, is bare and 276 feet high; it lies N.E. $\frac{1}{2}$ E. 18 miles from West hill. About 3 cables S.W. of this islet is a reef awash at low water. Marsh reef, which covers at a quarter flood, is three-quarters of a mile South of the islet.

h. peak, or Timonee islet, 3 miles N.E. by E. of h. l., is one mile long and rises to a bare peak 620 feet high. A shoal with about 2 fathoms on it is reported as lying from one to $1\frac{1}{2}$ miles W.S.W. from h. peak islet, also shoal water about one mile south-westward of the same islet. Bluff islet, the easternmost of the cluster, and N.N.E. 3 miles from h. peak islet, is bare, and its east end forms a remarkable overhanging bluff.

Curlew island, the largest of the cluster, is nearly 2 miles long N.E. and S.W., and one mile broad; the summit is 520 feet above the sea; the north point is a remarkable conical hill 454 high with a bolder on

the top. A number of small islets and rocks lie off the shores of the island. Some rocks and shoals occupy the space between the island and Dinner islet, one mile south-east of the south point. On the western side are Wallace islet distant half a mile, and Pearl rock, and foul ground extends off for upwards of one mile; and off the north end of the island shoals extend nearly to Henani rock, which lies N. $\frac{3}{4}$ E. 2 miles from the point. There is also a 2 fathoms shoal N.N.W. $3\frac{1}{4}$ miles from Curlew island.

Pearl shoal, which is of sand, narrow and steep-to, extends $2\frac{1}{2}$ miles S.W. $\frac{3}{4}$ S. from Wallace islet. The least water on the shoal is 3 feet at a distance of $1\frac{3}{16}$ miles from the shore.

Rocket spit, of sand and steep-to, with depths of from 12 to 15 feet over it, extends to the south-westward from h. 1. (Douglas islet), from the top of which its extremity lies S.W. by W., $1\frac{1}{4}$ miles. With the flood tide there is a heavy rip over the spit.

Caution.—Vessels are recommended not to approach the h. h. cluster within 4 miles, as detached dangers exist all round the group, which has not yet been completely examined.

Unless thoroughly acquainted with the navigation, vessels of heavy draught are recommended not to pass to the westward of Beverley group.

TIDES.—It is high water, full and change, at h. h. (Guard fish) cluster, at 1 h. 20 m., springs rise 14 to 18 feet. The flood stream runs to the southward, and the ebb north-eastward. Both streams run with great strength past the west side of Curlew island.

BEVERLY GROUP* is a chain of small, but elevated isles, extending nearly in line, E.S.E. and W.N.W. 11 miles, the south-easternmost islet lying E. by N. 24 miles from cape Palmerston. A detached rock above water lies about a mile to the eastward of the central island, but the water appears to be deep along the eastern side of the group. Several other small islands lie from 2 to 7 miles south-westward of the Beverly group, to which they may be said to belong; Granite island, the largest, with two hills on it, lies N.E. by E. $\frac{1}{4}$ E. 13 miles from cape Palmerston, and S.W. $\frac{1}{2}$ S. 4 miles from the north-westernmost of the Beverly group. Constance islet, $1\frac{1}{2}$ miles in circumference and 100 feet high, lies E. by N. $\frac{1}{4}$ N. 13 miles from cape Palmerston, and S. by E. $2\frac{3}{4}$ miles from Granite island. A sand spit extends half a mile off the south-west point of the westernmost of these islands.

Double Isle, N.E. $\frac{1}{4}$ E. 4 miles from the north-westernmost of Beverly isles: is nearly 3 miles in circumference, and has a detached rock above water, close northward of its western point: there is a deep channel, nearly $3\frac{1}{4}$ miles wide, between Double isle and Beverly group.

* See Admiralty chart, Australia, east coast, sheet XIII. Queensland, Percy isles to Whitsunday island, No. 347; scale, $m = 0.25$ of an inch.

Prudhoe Isle, the north-westernmost and largest of Northumberland isles, is $2\frac{1}{2}$ miles long, N.W. and S.E., and nearly as broad near its southern end; it rises to two peaks connected by a narrow, low neck of swampy land. The southern, which is the higher peak, is 1,026 feet high, and bears nearly N.E. by N. 17 miles from cape Palmerston. Two low rocks with deep water between them, lie off the north-west end of Prudhoe isle, the outer, N.W. by W. $2\frac{1}{2}$ miles; and the other West $1\frac{1}{2}$ miles distant. A shoal, on which are rocks above water, lies 2 miles off the south extreme of the island, with deep water between. On the west side of the isthmus connecting the two peaks on Prudhoe isle, is a small sandy bay with rocks close off it, affording a good landing place. The hills are covered with long grass over loose stones, with a few stunted trees; no fresh water was seen in March 1843.

Tidal Streams.—Close off the west side of Prudhoe isle the flood stream was found setting 3 knots to the southward.

H.M.S. *Hecate* found the ebb stream between Prudhoe and Bailey isles setting northward 3 knots; great caution is therefore necessary when passing through this part of the Inner route.

PERCY ISLES* form a distinct group, to the eastward of Northumberland isles, and extend over a space of 20 miles from South-east isles, N.W. by N., to No. 4 isle; and 8 miles across, at the centre of the group.

No. 1. Isle the southernmost, and second in magnitude of the Percy group, is somewhat of a triangular shape, and $3\frac{1}{2}$ miles in extent, its north-eastern angle forming the extremity of a narrow hilly point extending 2 miles from the main body of the island. Hixson islet, a rock 66 feet high with pine trees growing on it, lies half a mile off the western point of the island; there is a clear channel between the rock and a rocky tongue projecting one-third of a mile from the island, with a depth of 5 and 6 fathoms. On the north side of the island, to the eastward of the western point, is a small hard sandy bay, with Howard islet 86 feet high, another pine islet, at a quarter of a mile off its eastern point.

There are two peaked hills on No. 1. Percy isle, the south-eastern and higher of which is 641 feet high, and is craggy and difficult to ascend. On the hills, which are very rocky, the grass grew luxuriantly, although the soil is shallow and poor: but in the gullies was found some good loamy ground. Few pine trees were seen that exceeded 40 feet in height.

Water.—Captain King, in the beginning of June 1818, and Captain Denham, in July 1859, watered their vessels at a stream which ran over the east end of the beach. Captain King says:—The bay at the west end

* See Admiralty plan:—Percy isles, No. 351; scale, m = 1 inch.

of No. 1 isle is of very steep approach and not safe to anchor in, excepting during a south-east wind. The hills are intersected by numerous gullies, and are consequently supplied with streams; but the most convenient watering place for vessels is that he used, except during a northerly or a westerly wind, when the practicability of landing on any part of the north side of this island is very questionable, for the task was difficult even with the wind blowing off the shore.

A number of goats were landed on No. 1 Percy island, and potatoes and water melons were planted near the watering place, in 1874.

South-east Islets are five in number, lying about 5 miles eastward of No. 1. Percy isle. There is deep water close to the northward of the islets; but the space between them and the island has not been sounded.

No. 2. Isle, the largest of the Percy group, lies 4 miles north-westward of No. 1. isle, and is $4\frac{1}{2}$ miles long N.W. $\frac{1}{2}$ W. and S.E. $\frac{1}{2}$ E., and $3\frac{1}{4}$ miles broad. It consists of a series of hills in ridges, the highest of which, near the south-east coast of the island, rises to an elevation of 832 feet; many of the hills are covered with gum tree scrub, and all with long grass growing in tufts, concealing the loose stones, and rendering walking very laborious.*

The north-east and southern sides of No. 2. Percy isle appear to be rugged and exposed. The Spurs, are dry rocks close off the southern shore, between which and No. 1. Percy isle, is a deep and clear channel 3 miles wide.

Pine Islets, which lie close off the cove or lagoon on the west side of No. 2. Percy isle, are small and rocky, with pine trees growing on them, and connected with each other by a shoal, the largest islet being 240 feet high; there is a passage two-thirds of a mile wide, between them and the island, with from 7 to 14 fathoms sandy bottom. Pine trees and wood for fuel may be procured with facility.

Normanby rock, of only 50 feet in extent, with 5 feet on it at low water springs, and 13 fathoms all round, lies nearly $1\frac{1}{2}$ miles to the south of the southern extremity of Pine islets. Pine peak, kept open on either side of Pine islets, leads clear of the rock to the eastward or westward, as the case may be; and the islet off the south end of the north-east. Percy island, kept open southward of the Spurs, leads clear to the southward.

* Mr. Strange, the Government geologist, who, with three of his companions, were murdered while obtaining fresh water on No. 2. Percy isle in February 1855. This treacherous act was perpetrated by natives from the mainland, who had landed at this island to fish; and the circumstance is mentioned as a warning to future visitors.

Anchorage.—The best and most convenient anchorage at No. 2. Percy isle, and indeed the only one to be recommended, is where the *Investigator* and *Herald* lay, directly off the entrance of a little cove $1\frac{1}{2}$ miles northward of the south-west extreme of No. 2 Percy isle, and between the isle and the Pine islets: it is sheltered for 14 points to the eastward and 3 points towards the west, and there being a clear passage out, both to the north and south, no danger is to be apprehended; the bottom, however, does not hold very well. With northerly winds vessels may find fair shelter, anchored south of Pine islets in 7 to 9 fathoms.

N.E. Isle is separated from the east point of No. 2. Percy isle by an opening $1\frac{1}{2}$ miles wide: there are two hills on the isle, and some rocks above water lie near its south-east extreme, the south-easternmost being Boat rock.

Pine Peak, or No. 3. Percy Isle, N. $\frac{1}{4}$ E. $5\frac{1}{2}$ miles from the north point of No. 2. isle, is about 2 miles long East and West, and one mile broad, with numerous points running out from its shores. It rises to a very steep peak covered with pine trees, visible at a distance of 30 miles; and a rock dry at low water, lies half a mile northward of the island.

Between Nos. 2. and 3. Percy isles is a clear passage $5\frac{1}{2}$ miles wide, with from 26 to 30 fathoms water; but there are occasionally strong tide rippings in this channel.

Sphinx Islets are a small islet and a rock above water, close off its south-west point; the former, which is somewhat peaked, lies W. by S. $\frac{3}{4}$ S. 5 miles from No. 3. Percy isle.

Enterprise Reef, is a reported danger of doubtful position, upon which breakers are said to have been seen, lying W. by S. $\frac{3}{4}$ S. $7\frac{1}{2}$ miles from Sphinx islets.

No. 4. Isle, North 2 miles from No. 3 Percy isle, consists of two small islands connected by a reef, with rocks upon it, the whole being about 4 miles in circumference: the eastern isle is irregularly shaped and moderately high. Three rocky islets lie N.E. by E. $1\frac{1}{2}$ miles from No. 4.; the channel between the islands and rocks having 33 fathoms water.

There is a channel 2 miles wide between No. 3. and 4. Percy isles, with deep water, and no other danger than the rock North of No. 3 isle already noticed as dry at low water.

TIDES.—It is high water at Percy isles, full and change, at 10h. 30m. At No. 2. isle, springs rise 16 feet, neaps 13 feet. The flood sets to the south, and the ebb to the north, past the anchorage at No. 2. Percy island, this is an eddy; but outside they run S.W. and N.E.

The COAST.—**FRESH-WATER POINT,** N.W. by W. $\frac{1}{4}$ W. 11 miles from cape Palmerston, is a low projection of the mainland, termi-

nating in two points between which was discovered a small quantity of fresh water, in March 1843; some sunken rocks lie close off the points.

Between cape Palmerston and Fresh-water point, the coast is indented by deep bays, with low mangrove shores, intersected by creeks, some of which run several miles inland; the creeks are all dry at low water, and sand-flats extend from the bays to a little beyond a line from cape Palmerston to Fresh-water point. The points between the bays are of moderate height, covered with vegetation, and faced with steep cliffs, from which ranges succeed each other into the interior, gradually increasing in height until they attain an elevation little short of that of Long hill.

There is a small round island 355 feet high, N.N.W. $\frac{1}{4}$ W. 5 miles from cape Palmerston, from which a spit projects south-westward, and foul ground south-eastward. A rock covered at half tide, lies E. by S. 2 miles from the islet; and N.E. $\frac{1}{2}$ N. 3 miles from it is a small islet 40 feet high, with a shoal covered at high water, immediately to the southward.

Close on the north side of Fresh-water point is a shallow inlet with salt water creeks extending inland; it is about 2 miles wide, but dries at low water.

The coast from Fresh-water point takes a N.N.W. direction nearly 9 miles to Hay point, with a reef, which dries at half tide, extending three-quarters of a mile to the northward. At about $3\frac{1}{2}$ miles south-eastward of this point are two small rocky patches about $1\frac{1}{2}$ miles from the shore.

Hay point forms the south-east extreme of a bay extending N.W. by N. $8\frac{1}{4}$ miles to the east entrance point of Pioneer river. Between 3 and 5 miles north-westward from Hay point is Sandy creek, which is $1\frac{1}{2}$ miles wide and dries at low water, and extends $2\frac{1}{4}$ miles south-westward. At half-way between Sandy creek and the north-west point of the bay, the low coast is intersected by creeks, and fronted by a shoal with as little as 9 feet water on it, at nearly $1\frac{3}{4}$ miles from the shore.

On the west side of the bay westward of Hay point, is a round hill about 100 feet high, having a bluff face to seaward with patches of sandstone, which show white to the eastward, but have a reddish colour when seen from the northward.

Anchorage.—In the bay westward of Hay point, there is anchorage for small vessels during south-easterly winds, sheltered by the reef to the eastward.

The best anchorage for small craft is with Hay point bearing S.E., and the bluff W.S.W.

To round Hay point and reef, bring the bluff on the western side of the bay to bear S.W. by W. before hauling up for the anchorage. The water shoals from 3 to 2 fathoms, muddy bottom, at a distance of about three-quarters of a mile from the shore.

When standing from this anchorage towards the entrance of Pioneer river, a vessel will be clear of the shoal extending off Sandy creek and the mainland, while Slade point is open to the eastward of Flat-topped island.

Rocky Islets, which show the entrance of Pioneer river, are two in number, lying nearly E.S.E., distant respectively $1\frac{1}{2}$ and $2\frac{1}{2}$ miles from the east entrance point of the river. The south-eastern islet is round topped and moderately high; whilst the inner islet, although about the same height, is flat topped. Flat-top islet is used as a depôt for the coasting and mail service, and upon it is a signal station, from which a light is exhibited.

There is a clear channel between these islets; but that between Flat-top islet and the mainland is contracted to a quarter of a mile in width by a sand spit, extending from the southern extreme of the islet towards the east entrance point of the river, and by a spit from East point, stretching towards the island. When in the middle of this channel, a small rocky islet N. by W., 4 miles from Flat-top islet, will be in line with the peak of the island, bearing North.

PIONEER RIVER, which is only accessible to coasters, has a bar across its mouth, which nearly dries at springs. From the bar, the depth of the channel, which has an average width of one cable, varies from one foot to 5 feet at low water, until within about three-quarters of a mile of the town of Mackay, situated about 4 miles above the bar, when it again almost dries across, and from thence the depth gradually increases until abreast of the town, where there is about 6 feet at low water, in the centre of the channel. The channel of the river to the town of Mackay is buoyed and beacons.

Heavy freshets occasionally alter the banks in the river though not the general character of the channel; the buoys and beacons are shifted when necessary. Strangers should not take the bar without a pilot.

A Pilot and boat are stationed at the entrance of Pioneer river.

LIGHT.—From the signal station on Flat-top islet, a *fixed* white light is exhibited at an elevation of 174 feet above high water, and should be visible in clear weather between the bearings N.W. and S. by W. (except where intercepted by Round-top islet between N. 58° W. and N. 64° W.), from a distance of 19 miles. A sector of *red* light is shown between the bearings N.W. and N. by E.

TIDES.—It is high water, full and change, on the bar of Pioneer river, at 11 h. 7 m.; springs rise from $10\frac{1}{2}$ to 16 feet. At Mackay the rise is from 6 to 12 feet. The tidal streams in the river run from 3 to 4 knots, but are much influenced by prevailing winds.

Signals.—The following signals, indicating the depth of water on the bar of Pioneer river, will be shown from the pilot station and, when necessary, will be repeated from the signal station on Flat-top islet.

A red burgee will be hoisted at the masthead during flood tide.

	ft. in.		ft. in.
Ball north yard-arm	- 6 0	Ball over flag north, ball south	
Ball south yard-arm	- 6 6	yard-arm	- 12 0
Flag north yard-arm	- 7 0	Ball over flag south, ball north	
Flag south yard-arm	- 7 6	yard-arm	- 12 6
Ball at each yard-arm	- 8 0	Flag over ball north, ball south	
Flag at each yard-arm	- 8 6	yard-arm	- 13 0
Two balls north yard-arm	- 9 0	Flag over ball south, ball north	
Two balls south yard-arm	9 6	yard-arm	- 13 6
Ball over flag north yard-arm	- 10 0	Two balls north, flag south yard-	
Ball over flag south yard-arm	- 10 6	arm	- 14 0
Flag over ball north yard-arm	- 11 0	Two balls south, flag north yard-	
Flag over ball south yard-arm	- 11 6	arm	- 14 6
			and up-
			wards.

By night, when vessels require to enter :

	ft. in.		ft. in.
Red light	- 6 0	Two red lights horizontal	- 11 0
Green light	- 6 6	Two green	- 11 6
Red light over white	- 7 0	White light north, red south	- 12 0
" under "	- 7 6	Red " white "	- 12 6
Green light over white	- 8 0	White " green "	- 13 0
" under "	- 8 6	Green " white "	- 13 6
Red light over green	- 9 0	Red " green "	- 14 0
" under "	- 9 6	Green " red "	- 14 6
Two red lights vertical	- 10 0		and up-
Two green "	- 10 6		wards.

DIRECTIONS.—Vessels intending to enter Pioneer river should not run down on the lee shore when it is blowing hard from east or south-east ; but should anchor under the lee of some of the islands off the coast, until the weather moderates. In moderate south-easterly weather, a vessel would find sufficient shelter under the lee of Flat-top islet, being careful to avoid the sand-pit extending from the south extreme of that islet towards the east entrance point of the river ; coming from the southward, after rounding the spit, a vessel should be hauled up gradually towards the north-west end of the island, and anchored as convenient. This anchorage should be used with great caution, as the holding ground is bad, and detached knolls of coral lie some distance out from the island. In passing out to the northward through this channel, or from the anchorage under the island, the north-west point of the island should not be approached too closely—a reef extending a short distance from it.

The small rocky islet south-eastward of Slade point, in line with the peak of m isle, bearing North, will lead westward of Flat-top island in 9 or 10 feet.

Anchorage will also be found under the lee of Round-top islet in from 5 to 6 fathoms at low water, the bottom being blue sandy clay.

When the south-west bank (off which the first black buoy is laid) just within the bar, or when the reef off the south-west end of Flat-top is well covered, vessels drawing 7 feet can enter the river.

Vessels requiring a pilot may, in very fine weather, anchor off the Fairway buoy, in 6 or 7 fathoms, the best holding ground being with Slade point on with the south-west extreme of Flat-top islet, and the centre of Round top islet bearing East.

Proceeding for Pioneer river from the northward, care must be taken to avoid a dangerous reef, nearly midway between the islets off the river and rocky islet to the northward, which lies 2 miles south-eastward of Slade point. There is, however, a clear passage between this reef and the mainland, and also between rocky islet and Slade point.

During steady south-easterly or southerly weather, vessels from the southward intending to enter the port without a pilot, and having to wait for the tide, will, if not drawing more than 8 or 9 feet, find the best shelter under Hay point, in smooth water, and out of the tide way.

To cross the bar, keep the southern hill of a double hummock, which is about 8 miles inland, on with the hollow of Saddle-back mountain, distant about 20 miles. This will lead to the Fairway buoy, which may be passed on either side; the buoy is in 4 fathoms at low water, about 2 cables from the edge of the shoal water, and is chequered black and red, and carries a flag similarly chequered. From the buoy two white beacons, the innermost of which is surmounted by a red ball, will be seen on the beach, which kept in one, show the best line for crossing the bar. While crossing, be careful not to get too far towards the south-west side of the marked channel, a large sand-bank lying on that side, 6 to 8 feet above low water mark.

Entering the river while the banks are covered, vessels should be careful to make proper allowance for the set of the tide streams which then run with great force across the channel. While any tide is running, the sides of the banks are generally visible, and there is little difficulty in navigating the river if proper attention is paid, and the lead kept going. From the narrowness of the channel, the port is only suited to short vessels.

At night.—The light bearing S.S.W. leads eastward of Llewellyn shoal, Singapore rock and the foul ground extending off Shoal point, also clears the ledge off Rocky islet and the dangerous reef northward of Flat-top islet. The reef off Hay point will be avoided by keeping within the south west limit of the white light.

Mackay, a town on the south bank of Pioneer river, about 4 miles from the sea, is the port of a considerable district in which sugar is extensively cultivated, and other tropical productions. In 1872 the combined exports and imports were valued at 55,702*l*. Population, 1,500.

There is weekly communication, by steam, between Mackay and Brisbane, and the mail steamers to and from Torres strait call off the river's mouth.

SLADE POINT, N. $\frac{3}{4}$ W. 5 miles from East point of Pioneer river, is a hilly projection enclosed by a rocky shoal, which may be approached in 5 fathoms, within a mile of the point. On the west side of the point is a shoal bay, with a creek trending to the southward.

Shoal Point, N.W. by W. $5\frac{1}{2}$ miles from Slade point, is the rocky extremity of a grassy projection sloping down from the hills at the back of it; there are rocks close off it, and an islet lies one mile N.N.W. of the point, easily distinguished from seaward, by its white cliffs.

A number of shoals and knolls of loose, light-coloured sand extend to the north-eastward 7 miles, from Slade point, and are 6 miles across, north-west and south-east. A small patch with 4 fathoms water on it, lies nearly N.E. $\frac{1}{2}$ E. 9 miles from the point, with a clear channel 2 miles wide, and having 6 and 7 fathoms water, between this patch and the main body of the shoals. Inside this channel are two others; the outer, in which the least depth is $3\frac{1}{4}$ fathoms, lies 5 miles, and the inner, with $3\frac{1}{4}$ to 5 fathoms, lies $1\frac{1}{2}$ miles outside Shoal point. As these two passages are between shoals, with only 3 to 12 feet water, without leading marks to clear them, it would be prudent to take the channel immediately inside the 4-fathoms patch, or pass outside of it, taking care to look out for another 4-fathoms patch lying about 2 miles to the eastward of that just noticed.

It is said that the ship *Lady Elliot*, in 1815, met with shoals having 9 feet water on them, lying N.E. 10 miles from the island off Shoal point; they were not, however, seen by the boats of H.M.S. *Bramble*.*

Llewellyn Shoal, (discovered by Staff Commander E. P. Bedwell, in 1878), with 3 fathoms water on it, lying N.E. of Slade point distant $6\frac{1}{2}$ miles, being within the limits of the white light; it is intended to show a sector of *red* light through an arc of 10° , on the western side of the sector, so that with the white light in sight, vessels will be clear of danger.

Cape Hilsborough, N.W. by W. 8 miles from Shoal point, is a bold headland 955 feet high, its sea face presenting, in many parts, steep cliffs of sandstone; most of the other parts are thickly wooded, fine pine trees being very abundant, but the summit is comparatively barren. The cape is connected with the mainland by a low mangrove-covered neck of land. Although this projecting headland would appear to afford shelter on its north side, from south-easterly gales, there is no good anchorage, the bottom being of a soft muddy nature.

* Captain F. P. Blackwood remarked, that during his survey, patches consisting of fine sand were observed floating on the surface, having the appearance of shoal water: they are very deceptive, but not uncommon, after a strong breeze and high tides.

Lieutenant C. B. Yule also observed extensive patches of discoloured water between cape Palmerston and Shoal point, which on an examination, proved to be minute particles of marine animal, or vegetable matter, called by seamen *sea saw-dust*.

As there are only a few sunken rocks closely fringing the north-east side of cape Hilsborough, it may be safely approached from seaward within a mile, in from 5 to 6 fathoms. At W.S.W. nearly 3 miles from the cape, rise some peaked hills, which are so very curiously shaped as to be remarkable when seen from the sea; one of them, quite a sugar-loaf in form, and needle-pointed, is 700 feet high.

The coast between Shoal point and cape Hilsborough, is low and intersected by creeks, the north-western part forming a shallow muddy bay; and the whole being bordered by a shallow flat extending about $2\frac{1}{2}$ miles from the shore.

Aspect.—The general appearance of the country from cape Palmerston to cape Hilsborough, is diversified by mountains, plains, hills, and valleys, and seems well clothed with herbage and wood, having altogether a very verdant and pleasing appearance. To the northward, the hills bordering the coast, become more lofty and isolated, some being peaked and others saddle-shaped. At about S.W. 8 miles from cape Hilsborough, a very remarkable double-hummocked mountain rises to an elevation of 2,160 feet, with the peaks separated by a narrow and deep gorge. Another double-hummocked hill, but of less striking features and elevation, bears S.S.W. $\frac{1}{2}$ W. distant about 5 miles from Shoal point.

Water.—Close westward of a small, but bold headland, 3 miles westward of cape Hilsborough, was a chain of fresh-water ponds, in March, 1843, in a meadow-like piece of ground, with a small stream running down from them, and oozing through the beach into the sea. By digging wells, water may doubtless be found there at all seasons of the year.

The COAST.—From cape Hilsborough, the coast takes nearly a N.W. by W. direction 23 miles to Midge point. This portion of the coast, the features of which are somewhat more varied than to the southward, consists of a number of rocky points and shallow bays, the latter dry at low water, and closely skirted by numerous islets, rocks, and shoal patches, generally connected with the mainland at low water, by extensive flats of mud and sand.

At $2\frac{1}{2}$ miles north-westward of the watering-place just mentioned, is a point with two clifty islets of a reddish colour, close off it. W.N.W. from $1\frac{1}{2}$ to 4 miles from these islets are three larger ones, connected with the mainland by sand and mud-flats, which dry at low water. These islets are remarkable from the white cliffs which they present seaward; they nearly join each other, and have rocks and shoals to the south-east, east, and north-west of them. From the north-westernmost, or largest islet, the low muddy shore trends N.W. 15 miles to Midge point, which is low, and forms the south-west horn of Repulse bay, with some rocks projecting about a mile north-eastward of it. Close southward of Midge point,

a muddy creek runs inland in a S.W. direction, but it dries at low water, and is fronted by a chain of islets, rocks, and reefs. There is a double hill 1,150 feet high, at about $3\frac{1}{2}$ miles to the westward of the point.

The shore at the back of the extensive flats connecting the clifly isles with the mainland, appears to be a margin of mangrove wastes, fronting a fine-looking forest country.

Directions.—The soundings off this part of the coast are regular, with muddy bottom, and as there appear to be no outlying dangers, it may be approached to depths of 4 to 6 fathoms at 3 miles from the shore.

Natives.—It is requisite to be cautious in landing, as the natives about this part of the coast appear to be particularly hostile; they visit the numerous islets in small tribes, are well armed with spears and waddies, and on two occasions disputed Captain Blackwood's landing.

CAPE CONWAY.—N.N.W. 24 miles from cape Hillsborough, is a hilly promontory 1,637 feet high, stretching out 8 miles to the south-eastward, and forming the west point of the southern entrance of Whitsunday passage. See page 199. The south side of the cape is bold close-to; but a ledge of rocks extends upwards of half a mile to the eastward of the cape, the outer rock being covered at high water, which is, however, denoted by strong tide ripples over it.

Repulse Bay, which is 13 miles broad, between cape Conway and Midge point, is so named, as on coming from the southward, it might easily be taken for a clear channel, or even for Whitsunday passage, from the peculiar formation of the hills on either side of the low land behind the northern part of the bay, which, being a flat country, is not visible until approached within a short distance.

The soundings in the bay are regular, but shoal within 5 miles of its bight, where a small river discharges itself into the sea. The stream is only fit for boat navigation, its broad entrance being choked up by extensive sand-flats. The channel inside winds along the south-western base of the lofty chain of hills extending to the north-westward from cape Conway. Captain F. P. Blackwood went a few miles up this creek, in March 1843, and passed through some fine grassy plains; it was not then very deep, and only 50 feet wide, with brackish water, 10 or 12 miles from its entrance.

Very few traces of natives were observed, although the stream abounded with fish, and appeared to be much frequented by wild fowl, &c.

Repulse Islands, which are three in number, are small and rocky, lying in the entrance of Repulse bay; the easternmost and highest is 265 feet high, and lies S.S.W. $\frac{1}{2}$ W. 4 miles from cape Conway. Although these isles are rocky, they are covered with luxuriant grass and have a few forest trees. They are surrounded by rocks; but as they do not extend

more than a quarter of a mile from the shore, the islands may be approached with safety, and small vessels may find anchorage amongst them.

TIDES.—It is high water, full and change, at the Repulse isles at 11h.; springs rise 18 feet.

The COAST.—At N.N.W. 4 miles from cape Conway is Round head, and a bay between appears to afford good anchorage out of the strength of the tide streams. The shore is a steep shingly beach, a few yards behind which Captain King found a hollow containing a good supply of fresh water in June 1819; but none could be found there in March 1843.

Half a mile North from the ledge of rocks running out from cape Conway, is the southern extremity of a narrow shoal, extending N. by W. $\frac{1}{4}$ W. 4 miles across the bay just mentioned, and to about $1\frac{1}{2}$ miles N.E. of Round head. This shoal, which is about three-quarters of a mile wide, is composed of hard sand, on which are knolls, with from 5 to 10 feet water on them, and a covered rock near its southern end. The depths are from 9 to 17 fathoms between the shoal and the bay.

From Round head a steep beach of shingle, backed by dense scrub and some clear grassy ground, skirts the base of the hills in a N.W. by W. direction for about 5 miles, and then nearly N. by W. 6 miles farther. In the bight thus formed is a small islet close to the shore, where there appears to be good anchorage, out of the influence of the tide streams, and the beach affords convenient landing places. There are 5 and 6 fathoms water close to the shore, from Round head to the islet; and the depths increase considerably to the northward.

Water.—At a few miles northward of the above islet, there was a good stream of fresh water running over the beach into the sea, in the month of April 1844.

Long Island, on the west side of Whitsunday passage, is 5 miles long, and from half a mile to one mile broad. Its southern extreme bears N.W. $\frac{1}{2}$ N. 5 miles from Round head. Two rocks lie close off the east side of the island. Shoal water extends $2\frac{1}{2}$ miles south-east from the south point of the island.

There is a deep channel between Long island and the mainland, leading northward into port Molle, but it is not advisable to adopt it from choice, as it is long and very narrow; and the land being high on either side, a sailing vessel would probably get becalmed and unmanageable in the tide streams, which rush through the channels in this locality, with great velocity.

Pine Head is the south-east extreme of a small island lying nearly in the middle of Whitsunday passage, *see* page 199, and separated from the southern end of Long island by a deep channel, about half a mile broad. The head is a remarkable bluff, clothed with pine trees: the remaining

portion of the island, although rocky with a shallow soil, produces luxuriant grass and some stunted trees. Near Pine head the tide streams run in strong eddies, for which reason it should not be approached nearer than half a mile, although there appears to be deep water close to it. A sandy bay on the south-west side of the island, affords a good landing place.

PORT MOLLE, immediately northward of Long island, is a secure and convenient harbour, containing an area of 3 or 4 square miles. The broadest and best entrance lies to the eastward, between the north extreme of Long island and Molle islands; it is 2 miles broad, and the north and south heads are both bold to approach. There are two other entrances, one to the southward, already described, on the west side of Long island, and the other, a mile wide, between Molle isles and the mainland.

Port Molle extends to the westward $4\frac{1}{2}$ miles from the east entrance; but the western side appeared shallow and chiefly occupied by a cluster of islets, the eastern and largest of which has a white rock half a mile south-eastward of its south extreme, and a low rock a quarter of a mile north-eastward of its north point. Between these islets and the southern shore, small vessels may find anchorage in 3 fathoms, out of the influence of the tide streams.

Port Molle is well protected, especially from south-easterly and south-westerly gales; it appears clear of sunken dangers, and is quite safe for vessels of any size to sail in and out of, by either the eastern or northern channel.

Anchorage.—The most secure and smooth anchorage in port Molle for large vessels, is in 9 fathoms, stiff clay and mud, in the south-east part of the port, off a sandy bay at the northern end of Long island, at half a mile from the shore. In about the middle of the harbour, the ground is foul and the water much deeper, there being in the east and north entrances from 20 to 24 fathoms.

Wood and Water.—Water may be obtained from a tea tree swamp, about one hundred yards back from the beach fronting the anchorage. Abundance of wood may be obtained, and the fir trees growing on the cliffs and heads around the entrance of the port are of excellent quality, fit for plank and other purposes; some of the pine trees seen were straight enough for masts.

DIRECTIONS.—A vessel entering port Molle by the eastern passage from the southward, during the prevailing south-easterly winds, may haul close round the south head for the anchorage, the shore being bold close-to; due allowance must be made for the tide streams, which, as before noticed, run at times with considerable velocity in the entrances and narrow channels.

Molle Isles, four in number, are small, high, and thickly wooded, extending N.W. by N. $5\frac{1}{2}$ miles from the high rock forming the north point of the eastern entrance to port Molle. The two easternmost, and largest islands of the group are separated from each other by a small islet, a mile south-westward of which is a larger one, with a 2-fathoms shoal lying close south-eastward of it; between these and a point of the mainland a mile south-westward, is the narrowest part of the north entrance of port Molle: the channel between these islands and the mainland is otherwise broad and deep.

Pioneer Point.—From port Molle a rocky shore extends N.W. $\frac{1}{2}$ N. 4 miles to Pioneer point, abreast the north extreme of Molle islands.

Pioneer Rock, three-quarters of a mile N.N.W. of Pioneer point, is well covered at high water and has deep water round it.

Anchorage.—There is a good anchorage from southerly winds behind Pioneer point; the bays west of the point have not been sounded, but the water in them is apparently shallow. The land can be approached safely by using the lead, as the soundings decrease very regularly.

Grimston Point, N.W. by W. $\frac{1}{2}$ W. 6 miles from Pioneer point, has a hill 390 feet high at the extreme end, connected with the mainland by a high sand bank; it has deep water on the east side, and a good anchorage with southerly winds on the west side.

Between Pioneer and Grimston points, is a bay 5 miles deep in which the depths appear to be from 10 to 3 fathoms.

George Point, is $9\frac{1}{2}$ miles N.W. $\frac{3}{4}$ W. from Grimston point; the coast between is a succession of bays, well open to the northward, with from 3 to 9 fathoms water in them, shoaling gradually, and each of the prominent points may be safely approached to within 200 yards.

Mount Dryander, the most lofty of the rugged-looking mountains which rise at the back of the coast between capes Conway and Gloucester, is in lat. $20^{\circ} 14' 10''$ S., long. $149^{\circ} 35'$ E., and is 2,935 feet above the level of the sea. The ranges to the south-eastward of it extend towards, and terminate at cape Conway; and High peak, 2 miles southward of port Molle, is 1,900 feet high. A steep ridge also extends north-westward from mount Dryander towards cape Gloucester.

CAPE GLOUCESTER,* 6 miles West of George point, is the termination of a high range of hills with several peaks quite disconnected from the Dryander hills; a coral reef extends nearly two-thirds of a mile North of the mainland, on the east side of Gloucester island passage, running in from thence and joining the land at the extreme north point of the

* See Admiralty chart, Australia, east coast, sheet XIV., Whitsunday island to Magnetic island, No. 348; scale, $m = 0.25$ of an inch.

cape ; opposite to which is a sand bank half a mile South, and $1\frac{1}{2}$ miles from the south-west point of Gloucester island. These reefs contract the channel to about 300 yards in breadth, having 9 feet water in the shallowest part, which is one-third of a mile E.N.E. of Passage islet. See page 201.

GLOUCESTER ISLAND, originally taken by Captain Cook for cape Gloucester, is 5 miles long, N.N.W. and S.S.E., and 2 miles broad ; it is separated from cape Gloucester by a strait three-quarters of a mile across. The island rises from its steep rocky shores to a ridge of peaks, the highest 2,000 feet ; that at its north-west extreme, N.N.W. $\frac{1}{2}$ W. 18 miles from mount Dryander, being 1,874 feet high ; although the sides of the hills are wooded, the island has altogether a sombre and heavy appearance. Gloucester island may be passed to the northward, at the distance of half a mile, in from 12 to 14 fathoms water, and there is anchorage in 7 fathoms, mud, on its west side.

Double Cone Island, 400 feet high, is the south-easternmost of a scattered chain of islands lying from one to 5 miles off the coast between Grimston point and cape Gloucester ; it is 5 miles N.N.E. of Grimston point, and, when seen from a distance appears as two islands, the neck connecting the two being about 50 feet high ; a coral reef joins this island with another half a mile to the south-west, and extends 400 yards off the south point of the latter ; there is deep water close to the north and west sides.

Armit Islands.—The largest is 550 feet high, and has deep water round its north and west sides ; a sand spit runs 100 yards off its south-west point, extending round to the south-east, and embracing two smaller islets half a mile off. One mile S.S.E. is a steep rock 80 feet high and 200 yards long, with deep water round it.

Gumbrell Island is a double-peaked island, 390 feet high, with a coral reef of 200 yards from the south-west and south-east points.

Olden Island, three-quarters of a mile from the shore and 2 miles South of George point, has a coral reef extending 200 yards from its south point, and one-third of a mile S.E. to a rock 20 feet high.

The last four islands lie nearly East and West of each other, and appear to have deep water between them.

Grassy Island, 545 feet high, and $2\frac{1}{2}$ miles South of Gumbrell island, has a coral reef running 200 yards off the south and south-east points ; there is a good passage between it and the mainland, clear of all dangers. Half a mile N.N.W. is a small wooded islet 40 feet high, from which a coral reef extends half a mile S.S.W., rendering the passage between dangerous.

Edwin Rock, one mile North of Grassy island, is 10 feet high and 100 yards across, with deep water round it.

Low Island, a low wooded islet $1\frac{1}{4}$ miles West of Grassy island, and a quarter of a mile from the mainland; a shallow sandy spit runs out one-third of a mile south-west from it.

Eshelby Island, nearly 5 miles N.E. of George point, and 170 feet high, is joined by a coral reef to a rocky islet, 50 feet high, close southward of it; with the exception of a rock 50 yards off the north-east end, there is deep water all round.

Hyacinth Shoal, said to have 2 fathoms water on it, and to lie 3 miles East of Eshelby island was diligently sought for by the boats of the *Fly*, but without finding it, or any indication of shoal water in the position assigned to it.

Rattray Island, W. by N. 4 miles from Eshelby island, is the northernmost of the group, and 375 feet high; it appears as two islands connected by a sand bank 20 feet high; a coral reef extends 200 yards off the south-west point; with this exception, although not sounded, there is apparently deep water all round.

Saddle-back Island, one mile W. by N. of George point, is a double-peaked island with a grassy spit running off its south-west point; a coral reef extends 100 yards off the south-west and south-east sides; there is deep water off the north end. One mile S.S.W. from the island, and half a mile from the mainland, there is a patch with $3\frac{1}{2}$ fathoms water on it.

About $2\frac{1}{4}$ miles W.S.W. of George point is a wooded islet about 60 feet high, with rocks extending a third of a mile to the westward, the passage between which and the mainland is blocked up with a coral reef extending from the islet round the bay, from a quarter to half a mile distance from the shore, in the direction of the south-east point of Gloucester island. A mile N.W. of the rocks just mentioned there is a detached reef nearly a mile from the shore.

Anchorage.—The best anchorages with south-east winds are under the lee of Pioneer, Grimston, and George points, (between Saddle-back island and George point,) and Grassy island. The only safe anchorage with a northerly wind is South of Grassy island.

CUMBERLAND ISLANDS are a chain of islands of various sizes, extending from about 45 miles eastward of Shoal point to 23 miles eastward of Gloucester island, and appear so like a continuation of the Northumberland islands, that it seems difficult to determine where one group terminates, and the other commences.

Cumberland islands are generally elevated and rocky, rising to peaks from 600 to 1,480 feet high. They are abundantly wooded, particularly with pine trees which grow to a larger size than at Percy isles. The islands appeared bold to approach, and the navigation amongst them to be without difficulty.

k 1. Isle, N.E. $\frac{3}{4}$ N. 18 miles from Prudhoe isle, rises to a peak 300 feet high, and is about $2\frac{1}{4}$ miles in circumference; a dry lumpy rock lies half a mile off its south-east end.

Juan rock, discovered in 1877, is described as one cable in diameter, to be awash, and to lie 3 miles S.E. $\frac{3}{4}$ E. from k 1. isle.

k. Isle, which is nearly 4 miles in circumference, lies N.N.W. 6 miles from k. 1.; it has a reef extending about $1\frac{1}{2}$ miles from both its south-east and north-west ends, on the former of which is a small rocky islet.

k 2. Isle, W. $\frac{1}{2}$ N. 7 miles from k. isle, is a hummocky island nearly $1\frac{1}{4}$ miles long, and three-quarters of a mile broad; it also has a reef reported to extend 2 miles off its north-west end, and another a mile from its south-east point, on which is a rocky islet.*

Three Rocks or small islets of moderate height, extending $1\frac{1}{4}$ miles North and South, lie N.W. by W. $\frac{1}{2}$ W. 3 miles from k 2. isle. A shoal is reported to extend a considerable distance north-westward from Three rocks.

k 4. and k 4 $\frac{1}{2}$. Islets, the former N.E. $\frac{1}{4}$ N. about 10 miles, and the latter E. by N. $\frac{3}{4}$ N. 7 miles from k. isle, together with two sandy islets westward of them, have only been seen from a distance; their positions must therefore be considered doubtful. The sand bank west of k 4 $\frac{1}{2}$. isle, is joined to the isle by a coral reef which dries at low water. At about 4 miles eastward of k 4 $\frac{1}{2}$. isle, Captain Flinders saw a sand-bank surrounded with rocks.

l Isle, W. by N. $\frac{3}{4}$ N. about 10 miles from k 2. isle, being out of the usual track of vessels, is little known.

l l. Isles, both together about 10 miles in circumference, are separated by a narrow strait, which is navigable, but intricate, from numerous shoal spits running out from its shores. H.M.S. *Fly* found temporary shelter from a strong south-easterly gale, in the southern part of the strait; but it is too confined to get under way from conveniently, unless favoured by wind and tide; it has also the disadvantage of being exposed to south-westerly winds. H.M.S. *Salamander* also anchored here in 1866, and found shelter from a strong south-easterly wind. This anchorage would probably be of great value to small craft, unable, from stress of weather, to enter Pioneer river. The tidal streams run through the strait with considerable strength.

There being a 20 feet rise of tide at springs, in this strait, it would afford a convenient harbour for laying a vessel on shore for repairs, where she could haul into a position not exposed to any winds. Rills of

* A reef (Phillis reef) about half a mile long N.N.W. and S.S.E. and 200 yards broad, is reported to lie with L 2 isle bearing W. by N. $\frac{1}{4}$ N., L isle W. by S., and K 2 isle S. by W.

fresh water were found in the gullies during the visit of the *Fly* in April 1844.

The peak of the eastern l 1. is 975 feet high, and bears nearly E. $\frac{1}{4}$ N. 22 miles from cape Hillsborough. Dry rocks extend about $1\frac{1}{4}$ miles from the south-east side of the island. A vessel merely stopping for the night would find a more convenient anchorage, in about 20 fathoms, on the north-west side of these isles, but the holding ground is bad.

Singapore Rock, on which the steam-vessel *Singapore* struck in 1877, is of small extent; its outer edge is awash at low water springs, and bears S. $\frac{1}{4}$ E. from the north-west extreme of the western l 1. islet, and W. by N. $\frac{3}{4}$ N. from the south-west extreme.

Bailey Islet, S.E. 8 miles from the eastern l 1. isle peak, is rocky and $1\frac{1}{2}$ miles in circumference, with its summit about 60 feet high. Some rocks awash lie off its northern extreme.

l 2. Isle, N.N.W. 6 miles from l. isle, is a small island on which Captain Flinders landed, and who thus describes it:—This little island is of triangular shape, and each side of it is a mile long; it is surrounded by a coral reef.*

l 3, and l 4. Isles, the former W. $\frac{1}{4}$ N. $6\frac{1}{2}$ miles, and the latter W. $\frac{1}{4}$ S. 10 miles from l 2. isle, are high, but being remote from the usual track of vessels, are little known.

m. Isle, which is high, bluff, and peaked, is about 3 miles long North and South, and $2\frac{1}{2}$ miles broad. A deep valley runs across the centre of the island, the northern side rising to a peak 1,113 feet high†, and bearing N.E. $\frac{3}{4}$ E. $15\frac{1}{2}$ miles from cape Hillsborough. A rocky islet, about 200 feet high and one mile in circumference, lies about N.W. by W. $\frac{1}{4}$ W. $3\frac{1}{4}$ miles from m. isle summit, and another (with a rock about 100 feet high, close to its east side) S. by W. $\frac{3}{4}$ W. $1\frac{1}{4}$ miles from the rocky islet. A rock awash at high water lies S.E. by E. $2\frac{1}{2}$ miles from the summit, with apparently shoal water from it, towards the S.E. point of m. isle. Another rock, the centre of which appears to be always above water, lies S.S.E. $\frac{1}{4}$ E. $3\frac{1}{4}$ miles from the summit. There are two rocks a short distance westward of the north point of the island. There is good anchorage, with easterly winds, on the west side of the island, at about half a mile off a small creek running into the valleys; and here a fishing party from the *Bramble* were once very successful with the seine.

SIR JAMES SMITH GROUP consists of ten or twelve distinct islands, Linné peak, on the principal and apparently easternmost

* Captain Flinders' *Terra Australis*, vol. ii. p. 94.

† As there is a considerable difference between Captains King and Blackwood, with respect to the heights of some of the Cumberland islands, the mean height has been taken where such differences occur.

of the group, is 994 feet high, and bears N.N.E. $16\frac{1}{2}$ miles from cape Hillsborough. Its reef, which dries at half tide, lies one mile West of the island immediately westward of Linné peak island. At S. by W. 5 miles from Linné peak is a small narrow island, about $1\frac{1}{2}$ miles long, with a detached islet nearly touching its south-east end; there appears to be deep water on either side of them. The three northernmost isles of this group lie close together in line, extending about $2\frac{1}{4}$ miles North and South; the central and largest of the three lies W. by N. 7 miles from Linné peak, and on its west side has been found good anchorage, sheltered from south-easterly gales. These isles are high and well clothed with wood, pine trees being abundant; they appear to be bold to approach on either side.

Kennard Rock lies N.N.E. $1\frac{1}{2}$ miles from the northernmost islet of Sir James Smith group, and is awash at three quarters ebb. There is a rock awash at low water, $1\frac{1}{2}$ miles W.N.W. of the north-eastern islet of the group.

THOMAS ISLAND, S.S.E. $\frac{1}{2}$ E. $4\frac{1}{2}$ miles from Shaw peak, and N. by W. 3 miles from Sir James Smith group, is 445 feet high, and well wooded on its western side. Inside an island in a bay on the north side there is anchorage for small vessels in 2 fathoms at low water. H.M.S. *Virago* anchored in the north-west bay in 11 fathoms, but this position would be unsafe with northerly winds, as the water shoals rapidly from 20 fathoms to the edge of the rocks not admitting of a vessel swinging inshore. The island close to the east point of Thomas island is rocky, with a few shrubs on its southern part.

Fairlight Rock, E. by S. half a mile from the east point of Thomas island, is a bare conical rock, 45 feet high.

St. Helen Rock, S. by W. $\frac{1}{4}$ W. $1\frac{1}{4}$ miles from Long rock, is about 20 feet high; there are 8 fathoms midway between it and Shaw island, and depths exceeding 15 fathoms at two-thirds of the distance towards Thomas island. The water appears shallow directly South of the rock.

Keyser Island, half a mile East of the south point of Shaw island, is bare, and about 250 feet high; there is deep water between it and Shaw island.

Long Rock, which is bare, and about 150 feet high, is separated from the south side of Keyser island by a deep channel a quarter of a mile broad: there is a detached reef off the eastern side of the rock. The outer part of the reef is always above water.

Shaw Island is 6 miles in length N.N.E. and S.S.W. and 2 miles broad; the western shore is formed of a series of sandy bays and rocky points; the eastern shore, of rugged cliffs with intervening sandy bays, fronted by rocks covered at high water. Shaw peak, its highest point, is

1,480 feet high, and very conspicuous, being the highest hill of the Cumberland group. There appears to be good anchorage on the west side, with the wind from any quarter, between Rocky islet and Shaw island in 6 fathoms, but the locality was only partially examined. H.M.S. *Virago* anchored off the northernmost sandy beach in 9 fathoms, where there is good shelter from all winds except those from the northward, but the tide runs strong. The seine may be hauled to advantage on the sandy beaches south of the peak, fish in abundance having been seen there.

Pine Islet, N.E. nearly one mile from the north point of Keyser island, is 140 feet high, and its upper part is covered with pine trees.

Triangle Island, S.E. by E. $\frac{1}{2}$ E. 2 miles from Shaw peak, is 150 feet high, bare and rocky; a detached rock, awash at high water, lies off its western point.

Mansell Island, E. $\frac{1}{2}$ N. $2\frac{1}{4}$ miles from Shaw peak, has a flat grassy summit, 630 feet high, otherwise the island is bare, and nearly surrounded by cliffs. A low cliffy island with a detached rock (awash at high water) off its western point, lies three-quarters of a mile West of Mansell island, and half a mile from Shaw island.

Platypus Rock lies S. by E. $1\frac{1}{10}$ miles from Burning point (the west extreme of Shaw island), and 3 cables off shore; it covers at half flood: 14 fathoms will be found half a mile West of the rock, and 6 fathoms one mile South of it.

Rocky Islet, N.E. by N. $1\frac{1}{2}$ miles from Burning point, is 52 feet high, with thick bushes on the summit.

Deserted Rock, N. by E. $\frac{3}{4}$ E. nearly one mile from Rocky islet, is low and bare. As the limits of the shallow water between Rocky islet and Lindeman island have not been defined, it is advisable, if intending to pass between Shaw and Lindeman islands, to pass close southward and eastward of Rocky islet and Deserted rock.

Seaforth Island, W. $\frac{1}{2}$ S. 3 miles from Shaw peak, is 190 feet high, and thickly wooded.

Spitfire Rock, awash at low water, lies S.W. $\frac{1}{4}$ W. about 4 cables from the south point of Seaforth island; from it Shaw peak bears E. by N. $\frac{3}{4}$ N., and cape Conway S.W. $\frac{1}{2}$ W.

Whitsunday peak open left of Passage peak, N. by W. $\frac{3}{4}$ W. leads $1\frac{1}{2}$ miles westward of the rock, and also clears Platypus rock.

Lindeman Island, $2\frac{1}{4}$ miles long North and South, is north-west of Shaw island, from which it is separated by a strait varying from two miles to half a mile broad. This island is beautifully wooded, and rises on its west side to a smooth grassy peak, 740 feet high. Thumb rock, about

40 feet high, close to the west point, is conspicuous from the southward. The northern portion of the island is disconnected at high water.

This is the only island of the group on which natives were seen, although traces of their having visited the others were observed.

Haycock Island, so named from its appearance, is 125 feet high, and lies rather more than a mile westward of Lindeman island.

Two islands lie westward of the north part of Lindeman island; the larger and western, 115 feet high, is in two parts connected by a neck of sand; a rock, covered at high water, lies 3 cables North from the island, and a ledge of rocks (uncovered at low water) extends a cable from the island, towards the rock. The smaller island is 82 feet high, round, and grassy; a ledge of rocks runs one cable off its south point.

Baynham Island, N.N.E. $2\frac{1}{2}$ miles from Shaw peak, is low and cliffy.

Maher Island, 570 feet high, lies North of Shaw island, from which latter it is separated by a channel one cable in width. A rock about 30 feet high, connected with the island at low water, lies close to its north point.

Pentecost Island, N.W. $\frac{1}{2}$ N. 5 miles from Shaw peak, is a very remarkable rock, like a tower rising out of the sea; the west side is wooded, and the fall on the north-east side is an almost perpendicular cliff, 965 feet high.

A rock, 25 feet above high water, lies S.W. by W. $\frac{1}{4}$ W. $1\frac{1}{2}$ miles from the summit of Pentecost island; there are 14 fathoms one mile West, and 12 fathoms one mile North from it.

DENT ISLAND, is 3 miles long N.N.W. and S.S.E. and three-quarters of a mile wide; its south point is E. by N. $2\frac{1}{2}$ miles from Pine head, at the narrowest part of Whitsunday passage—*see* page 199. The outer coast of the island has deep water within 200 yards. The small bays examined at the north-west end have coral reefs fringing them, and no anchorage. A strong tide runs round the north-west point.

Hamilton Island, W.N.W. $3\frac{1}{2}$ miles from Pentecost island, is 780 feet high at its eastern extremity, and thickly wooded. An islet lies off a bay on its south side, between which and the shore are two rocks, covered at high water.

Dent Passage.—A wooded islet, about 50 feet high and 200 yards in diameter, exists in the centre of the north end of the passage between Dent and Hamilton islands, which, with the exception of a coral reef which extends about a quarter of a mile S. by E. of the islet, is clear of danger, but contracted in breadth to about 300 yards by two wooded islets and a rocky coral reef running out from the east side of Dent island; there is a strong tide race in the passage, making it dangerous to run through.

Perseverance Island, 3 cables from the eastern extreme of Hamilton island, has a flat summit 310 feet high. A strong race and heavy tide rip will be found due North of the island, unsafe for boats, and on the flood tide especially, if there is much south-easterly swell.

Young Island, 180 feet high, lies a short distance eastward of Perseverance island; there are two rocks off its north point, the inner 45 feet and the outer about 5 feet above high water.

Surprise Rock, N. by W. $2\frac{1}{2}$ miles from the summit of Pentecost island, uncovers about 8 feet at low water springs, and covers at half flood. There are 9 fathoms between it and Young island, from which it bears E. $\frac{1}{2}$ N., $1\frac{1}{2}$ miles, at one third the distance from the latter.

Fitzallen Island is situated in the passage between Hamilton and Whitsunday islands; a ledge of rocks, dry at low water but with a rock in the centre always dry, extends a cable from it towards Hamilton island.

The channel south of Fitzallen island is considerably wider than that to the north, and the tide is not so strong; there are 11 fathoms in mid-channel, and 14 fathoms close to Hamilton island.

Henning Island, one mile North of Dent island, has a wooded rock 30 feet high a quarter of a mile West of its north end, with a reef running out to it from the island; deep water extends to within 200 yards outside of it and on the west side of the island.

A bank extends half a mile off the east and south-east sides, having a narrow deep passage a quarter of a mile broad between it and the islet in the north part of Dent passage.

WHITSUNDAY ISLAND, the largest of the Cumberland islands, is $11\frac{1}{2}$ miles long North and South; the broadest part is near its south end, where it spreads 9 miles between two points bearing nearly East and West from each other; immediately to the northward of these points the island is not more than 3 miles broad, forming a bay on either side. Four small islands extend from half a mile to 4 miles eastward from the east point; the southernmost and smallest of which is Pine islet. Two rocks lie near the shore at 3 miles north-westward from the east point, and at 4 miles to the eastward of the north point is a small island, with a rock above water between it and the shore.

From 7 miles E.N.E. of the east point of Whitsunday island, a chain of islets, rocks, and reefs, 10 miles long, extends north-westward to 6 miles E.N.E. of the north point of the island, and there appears to be deep water on either side of them.

A reef runs for 100 yards off Reef point, the west point of the island, with deep water and a tide race close off it; the two bays south-east of the point have coral reefs in them, and the soundings decrease so quickly

that no anchorage in a moderate depth exists in their neighbourhood. Rocks, awash at high-water neaps, extend 3 cables from the eastern point of the shallow bay abreast Henning island.

The large bay east of Daniel point is shallow. A shallow bank, with from $1\frac{1}{2}$ to 2 fathoms water on it, runs North of Daniel point, nearly stopping up the channel between Whitsunday and Hook islands; but a passage exists close southward of Hook island.

Whitsunday cairn on a hill, is a prominent boulder 1,300 feet above the sea level, a mile from the north end of the island. Whitsunday peak, near the west point of the island and 1,568 feet high, is well wooded, and is not prominent from the eastward.

Cid Island, $1\frac{1}{2}$ miles long and 670 feet high, lies nearly half a mile North of Reef point, and gives shelter to an anchorage between it and Whitsunday island. Cid island and Hill rock are connected by a bank; with this exception, deep water exists close in to the west shore.

The only danger inside Cid island is a bank running 200 yards South of the wooded islet, in the west side of the anchorage.

Anchorage.—There is an anchorage in 7 fathoms water out of the tide, in the mouth of the shallow bay South of Whitsunday peak; but the soundings decrease so suddenly that special care is required. This anchorage cannot be recommended; depths under 8 fathoms were found to extend nearly a mile from Whitsunday island to the centre of the sound.

The anchorage, between Cid island and Whitsunday peak, would be most secure were it not for the heavy squalls off the high land with southerly winds. In beating into the anchorage between Cid island and Daniel point with an ebb tide, an eddy running to the southward will usually be found close to Cid island.

The passage between Cid island and Reef point is clear of dangers, but the winds are baffling.

Water.—A good watering place, with deep water close to the rocks, exists under Whitsunday peak, east of the small peninsula, where with southerly winds a ship can anchor a quarter of a mile from the rocks. Should the stream be dry, water will always be found in the south part of the bay, but it will then have to be carried to the boats.

HOOK ISLAND has two inlets on the south side penetrating 3 miles towards the peak, which is 1,520 feet high. The shores of each have a fringe of coral extending from 50 to 100 yards off, which gets broader at the north ends. A 2-fathoms bank with deep water each side of it exists in the mouth of the west inlet; and a 3-fathoms bank extends across the entrance of the east inlet; there is deeper water inside the entrances. Owing to the high land on each side the wind in these inlets is very baffling, and great difficulty will be found in beating out of them.

Except the shallow bank between the south-east point of Hook and Daniel point of Whitsunday island no dangers were observed south or south-west of Hook island; the shores are steep-to within 100 yards.

Rocky hill, the highest hill on the west side of Hook island, has a rocky summit, and is prominent from the southward and westward. Hook peak and the others are well wooded to the top.

Half a mile off the north-east point of Hook island is a detached rock awash at low water, with deep water round it; with this exception no dangers were seen off the east coast, but the shore is not thoroughly fixed or sounded.

The narrows between Whitsunday and Hook islands has deep water in it; but rocks extend 100 yards off the south-east point of Hook island, so preference should be given to the Whitsunday side of the passage until approaching the shallow bank

Hayman Island, off the north-west point of Hook island, and the northernmost of the Cumberland islands, has deep water on the north and west sides, but there is a coral reef half a mile off the east and south sides, enclosing a small island off the south-west point.

A coral reef extends 200 yards from the north-west point of Hook island; but there is a deep-water passage, a quarter of a mile broad, between it and the coral reef East of Hayman island.

Langford Island, $1\frac{1}{2}$ miles S.S.W. of Hayman island, is 500 yards in diameter and 250 feet high, with a grassy spit on the south-east side. A sand bank, awash at high-water spring tides, extends E.S.E. two-thirds of a mile.

A coral reef runs for a mile both to the south and east of the island, the western edge is marked by a rock 20 feet high and 200 yards long half a mile South of the island, and the north-east end by the sand bank; the east point extends 200 yards East of the sand bank and has no mark upon it.

The south-west point of Hook island, shut in with the west point, will clear the reef.

At the distance of $1\frac{1}{2}$ miles South of Hayman island and East of Langford island is a low wooded islet with a coral reef all round; a narrow deep water channel exists between it and the reefs off Langford and Hayman islands; and a passage one-third of a mile broad between it and Hook island.

TIDES.—It is high water, full and change, at Thomas island, at 11h. 5m.; springs rise 21 feet.

Under Shaw peak the rise at springs is at least 20 feet, and at Hamilton island about 12 feet. The tidal streams make about the times of high and low water, the ebb setting to the northward and flood to the southward,

and run with great velocity at the following places: between Hamilton and Whitsunday islands; between Shaw and Lindeman islands; and among the islands south-east of Shaw island.

Water and Wood.—Water was not found in any large quantity on Cumberland islands, although at the time of examination it was the latter end of the rainy season. Wood is plentiful, but only large enough for making small spars.

Fish.—Large snapper in abundance were caught at Shaw island with hook and line; the seine was only hauled once, but from the steepness of the shore, without success. On the west side of the island, off a small creek, the seine was hauled with great success.

A few white cockatoos, Australian pheasants, and curlew were shot, but they are scarce and difficult to obtain. No snakes were seen on the islands, but they swarm with ants and lizards.

Wind and Weather.—From the 1st to 20th March the wind was south-easterly, average force 6, the greatest force being 8, with much wet weather. The remainder of the month was fine, with light south-easterly airs.

THE GREAT BARRIER REEFS BETWEEN THE PARALLELS OF
PORT BOWEN AND CAPE GLOUCESTER.

The Great Barrier reefs* form a coralline structure, unequalled in the world, for their vast extent and formidable obstructions to navigation. From Swain reefs at their south-eastern extremity, in lat $22^{\circ} 23' 12''$ S., long. $152^{\circ} 36' 54''$ E., they may be said to extend nearly 1,000 miles in a general N.W. $\frac{1}{4}$ N. (true) direction, following in great measure the sinuosities of the coast as far as the latitude of Cape Direction ($12^{\circ} 51'$ S.), when the barrier diverges from the coast in a northerly direction to Anchor bay, its north-western extremity, in lat. $9^{\circ} 22'$ S., long. $144^{\circ} 6'$ E.

The outer edge of the barrier varies in distance from the coast; in lat. $21^{\circ} 5'$ S., it is distant from port Bowen 140 miles; in $13^{\circ} 56'$ S. from Cape Melville 15 miles; and in $10^{\circ} 41'$ S., from Cape York 80 miles.

SWAIN REEFS, as just stated, form the south-eastern extreme of the Great Barrier reefs; and have their southernmost point about N.N.W. 142 miles from Sandy Cape. As the sea generally breaks heavily upon the outer edges of these reefs, they may be seen in clear weather, at a

See Admiralty charts, Australia, Coral sea and Great Barrier reefs, sheets 1 and 2, showing the Inner and Outer routes to Torres strait, Nos. 2,763 and 2,764; scale, $m=0.04$ of an inch. Also Australia, east coast, sheet XII., Keppel isles to Percy isles No. 346; scale, $m=0.25$ of an inch.

distance of 4 miles from a vessel's deck, and 6 or 7 miles from the mast-head. The south extreme of the reef has 50 to 60 fathoms water close to it.

Hixson cay, N.E. 5 miles from the south extreme of Swain reefs, is a sandy islet, situated on the outer edge of the reefs; but it is not sufficiently elevated to be seen at any considerable distance.

When sailing along their margin, the outer edge of Swain reefs seems to be formed of a series of small oval-shaped and circular patches, clustered together; but in reality there are clear openings between them, at least H.M.S. *Fly* found no difficulty in discovering a clear entrance. As approaching evening compelled the ship to seek an anchorage, she on two occasions ran through a different opening, and anchored just within the seaward edge of the barrier, in the following positions:—First in 16 fathoms, in lat. $22^{\circ} 13' S.$; afterwards in 17 fathoms, in $21^{\circ} 49' S.$ The trend of these two openings was N.N.E. and S.S.W., and the width from one to 2 miles, with a depth of between 25 and 30 fathoms in mid-channel. It is from the circumstance of the direction of the entrances lying so obliquely to the general trend of the barrier, that they are not clearly observed until they are well open. To see them thus, a vessel must be to leeward of the openings, and haul sharp up, with a south-easterly wind to enter them.

Few of the reefs seem to exceed 2 miles in diameter, and the openings were seldom more than 3 miles wide. A second line of breakers was generally observed inside.

Having delineated the outer ridge of Swain reef, from their southern extreme for 80 miles to the northward, the *Fly* took the first opening that presented itself, and after navigating through a labyrinth of reefs and shoals of every variety of form, succeeded in gaining the Inner route, in lat. $21^{\circ} 32' S.$, long. $151^{\circ} 23' E.$, the westernmost breaker from thence seen, being W.N.W. distant about 3 miles.

The water was smooth whilst passing through Swain reefs, and dry sandbanks were frequently seen on them. On clearing the inner edge of the reefs, the depths gradually increased to 40 and 45 fathoms.

The Inner Edge of Swain Reefs was traced by H.M.S. *Bramble* from their southern extreme to lat. $21^{\circ} 48' S.$, long. $151^{\circ} 56' E.$, and found to consist of a series of large reefs with deep channels between.

Herald, No. 1, is a reef lying south-westward of this series of reefs, and in lat. $22^{\circ} 7' 30'' S.$, long. $152^{\circ} 12' 30'' E.$

Herald Prongs, Nos. 2 and 3, are the south extremes of two of the reefs forming the inner edge of the Barrier, which appears to trend about W. by N. 36 miles from the *Bramble's* farthest to Herald reef-prong on the west side of the opening through which the *Fly* passed into the Inner route, after crossing Swain reefs.

Bell cay is a large sand-bank, lying in lat. $21^{\circ} 46'$ S., long. $151^{\circ} 15' 30''$ E., and surrounded by a reef which dries at low-water springs. The sand-bank, which is situated near the northern part of the reef, is about 200 yards long and 70 yards wide; it is covered with a thin layer of guano, and a scanty growth of bushes, and is visible from a vessel's deck 10 or 11 miles. Large numbers of birds frequent the bank, and in the season turtle abound, but no water was found. The reef is about $1\frac{1}{4}$ miles in extent, and on the eastern edge, upon which the sea breaks heavily, are many large boulders. H.M.S. *Virago* anchored on the north side, about a quarter of a mile from the edge of the reef, in 21 fathoms, but the bottom is hard and uneven.

Early in February 1843, the *Fly* and *Bramble* encountered a very violent gale from S.E., drawing round southward to S.S.W., while at anchor under the lee of the patch forming the southern extremity of Swain reefs.

TIDES.—It is high water, full and change, at Swain reefs, about 8h. 30m.; springs rise 7 feet. The velocity of the tidal streams on the reefs was from $1\frac{1}{4}$ to 2 knots; but it appeared to run with greater rapidity through the more confined channels. The general set of the flood is S.W., and the ebb N.E.

At Bell cay the tide at springs was found to rise 16 feet.

In the offing, at E. by S. $\frac{1}{4}$ S. 20 miles from Hixson cay, the *Herald* anchored in the great depth of 76 fathoms, where there were regular tidal streams, the ebb setting East three-quarters of a knot, and the flood West one knot; the stream veering later than low water, and earlier than high water, on the reef.

Caution.—A few feet rise and fall of the tide alter entirely the appearance of these reefs: at low water their margins show very distinctly, large masses of detached rocks appearing occasionally to fringe the horizon; the interior, or lagoon part of the reefs, are then of a light green colour, contrasting strongly with the dark blue of the channels between them; on the flowing of the tide, these features becomes less distinctly marked, and should there be passing clouds or strong tide ripplings, the most vigilant may be deceived.

The OUTER EDGE of the GREAT BARRIER REEFS, from the *Fly's* farthest, or the north extreme of Swain reefs, turns abruptly in a general W. $\frac{1}{4}$ N. direction for about 90 miles. From thence to the parallel of cape Gloucester, little appears to be known of the outer edge of the Barrier, Captain Denham not having approached within 20 miles of that part; but its probable trend is in a W.N.W. direction to 95 miles E. by N. of cape Gloucester.

The INNER LIMITS of the Great Barrier reefs from Herald reef prong, appear to consist of large scattered reefs with deep channels between, trending in a general W.N.W. direction to 32 miles eastward of Shaw peak ; those parts intruding most upon the Inner route being some reefs extending irregularly from about 33 miles north-eastward to 36 miles nearly northward of No. 2 Percy isle.

No reefs were seen from the mast-head by Captain Flinders between the end of those already mentioned, 32 miles eastward of Shaw peak, and the southern extreme of another reef lying N.E. $\frac{1}{2}$ E. 43 miles from the peak. But the track of his vessel being from 15 to 25 miles westward of where the inner limits may be supposed to trend, there is reason to believe that this space is also occupied by reefs not seen by him ; were it otherwise, the existence of an opening 30 miles broad would have been shown by a heavy swell setting in towards Cumberland islands, near Whitsunday passage, which has not yet been represented to be the case.

The irregular inner edge of the reefs next takes a general W.N.W. direction for 76 miles to 27 miles northward of Gloucester island ; the portion encroaching most upon the Inner route projects from the line of the inner edge to about 14 miles northward of Hook island.

The soundings are generally regular with this portion of the barrier, ranging from 24 to 36 fathoms, with sand in some places and dark mud in others.

Tidal Stream.—Captain Flinders found the flood stream rushing at the rate of 6 knots through an opening in the reef, at N.N.E. about 60 miles from No. 2. Percy isle.

INNER ROUTE FROM SANDY CAPE TO CAPE GLOUCESTER.

The Inner route is the passage between the Great Barrier reef and the east coast of Australia from Sandy cape to cape York, a distance of about 1,050 miles. There are two entrances into it from the south-eastward, one being Curtis, and the other Capricorn channel.

CURTIS CHANNEL, is entered between Breaksea spit and Lady Elliot isle, where it is 30 miles broad ; the centre of the entrance, in which are about 18 to 25 fathoms water, being from 6 to 8 miles within the 100-fathoms edge of the bank of soundings. The channel passes between Bunker and Capricorn groups, and the mainland, from Bustard head to cape Capricorn, then north-westward, along the coast by capes Manifold and Clinton ; the route afterwards leads northward round 1st, or High peak of Northumberland isles, and southward and westward of

Percy isles. The soundings are regular, and there do not appear to be any other dangers than those already described; but being more circuitous than Capricorn channel, the latter should be selected by vessels proceeding direct to Torres strait by the Inner route.

CAPRICORN CHANNEL is the broadest, shortest, and since a fixed and flashing light which is visible for 13 miles, has been exhibited on North reef, the safest entrance into the Inner route from southward. It passes between Capricorn group and the mainland about port Bowen, to the westward, and Swain reefs to the eastward; and then eastward of Percy isles: its average breadth being about 60 miles. See Leaving Keppel bay, page 135.

Soundings.—The depth gradually decreases from 80 fathoms in mid-channel, between Capricorn group and south extreme of Swain reefs, to 30 fathoms abreast port Bowen. The bed of the channel is a continuation of the bank of soundings extending from Breaksea spit to Bunker and Capricorn groups; the 100-fathoms edge of which, in mid-channel, being nearly in line between Bunker group and the south extreme of Swain reefs. The soundings are regular right across, from Swain reefs to the Capricorn group, and to the mainland, varying from 60 to 25 fathoms.

The nature of the bottom sometimes differs, but in general it is either a very fine sand or a soft olive-coloured clay and mud, with occasional patches of black shelly, or coral sand.

Should the depth of water decrease to less than 40 or 35 fathoms in the vicinity of Capricorn group, it is necessary to keep a sharp look-out for the islands and reefs. Great caution is also requisite in approaching the south extreme of Swain reefs, as there are 50 and 60 fathoms water close to it.

CAUTION.—It may not here be amiss to remark that although the lead should never be neglected in these seas, it must not be too implicitly trusted, as most of the reefs and coral patches (with which the northern part of the Inner route especially abounds) spring up so abruptly from the bottom, that the lead frequently gives no warning of their vicinity before a vessel approaches too near to avoid them. *A keen look-out from the mast-head, cool judgment, and ready action*, may, therefore, be urged as a general rule to ensure successful navigation amongst the reefs. To these hints it will be only necessary to add that a vessel should *never be steered in the glare of the sun*, except over such ground as may be safely navigated in the darkest night, as the glare makes it impossible to see the different colours of the water indicating dangers to be avoided.

Tidal Streams.—The strength of the flood sets into Capricorn channel about W. by N., and the ebb out, in the contrary direction, from

1½ to 2 knots; but from the prevalent south-easterly winds, it is to be presumed that a greater degree of north-westerly set will occasionally be experienced.

From PERCY ISLES to CAPE GLOUCESTER.—

There are two channels from Percy isles to cape Gloucester, one eastward, and the other westward of Northumberland and Cumberland islands; but the distance by the eastern and western channels being nearly the same, it is somewhat difficult to decide upon which is to be preferred.

Captain King recommends the eastern, or outer channel, thereby avoiding the strong tide streams in Whitsunday passage, and the calms which are likely to be experienced there, in consequence of the high land on either side.

Captain F. P. Blackwood said, in his remarks on the inner channel, he could see no objection to Whitsunday passage; although the streams run through with some strength, they appear to be regular; *see* page 199. He found the breeze always drawing through, and there was the advantage of having numerous sheltered spots for anchorage amongst the islands.

Lieutenant C. B. Yule is also inclined to prefer the inner channel, as it runs between the island and the mainland, which afford numerous and good guiding marks; whereas the eastern, or outer channel passes at a greater distance from the islands on the western side; and is chiefly bounded to the eastward by dangerous and imperfectly known reefs, instead of islands and the mainland. And he suggests, as a general rule in these seas, that a direct, though narrow channel between islands sufficiently high and remarkable to be easily distinguished, or along the coast with conspicuous objects, is far preferable to a much broader channel between islands and reefs more remote from the track, especially when making a passage at night.

Although the outer channel may offer some advantages to a sailing vessel, particularly in fine weather with an adverse wind, the inner channel is usually taken by steam vessels.

The EASTERN or OUTER CHANNEL, is bounded to the eastward by Bell cay, the inner limits of the barrier from thence to the sand-banks westward of islets k 4½, and k 4., a dry sand-bank seen by Captain Flinders nearly N. ½ E. 12 miles from l 2. isle, and the irregular edge of the reefs north-eastward of the northernmost Cumberland island.

It is bounded to the westward by 1st, or High peak, of Northumberland isles, Percy isles, k 1., k., k 2., and l 2. isles, and the chain of islets, rocks and reefs fronting the northern cluster of Cumberland islands.

The greatest breadth of this channel is about 30 miles, between Bell cay and 1st, or High peak, of Northumberland isles; and its least breadth is 5 miles, between the sand-bank to the westward of k 4½, and k isles.

The soundings are regular, varying from 22 to 37 fathoms. The bottom is in some places mud, and in others sand.

The WESTERN or INNER CHANNEL, from Percy isles to Whitsunday passage, is bounded on the eastern side by Percy isles, Bailey islet, l. and m. isles, and Sir James Smith's group; and on the western side by Sail rock, the doubtful Enterprise reef and the Beverley group, Double and Prudhoe isles, the mainland from Fresh-water point, to Slade point, the shoals off Shoal point, cape Hillsborough, and Repulse isles.

The least breadth of this channel is about $7\frac{1}{2}$ miles, between No. 2. Percy isle and Sail rock; and its greatest breadth is 23 miles, from Fresh-water point to a line from Percy isles to Bailey islet. The soundings are generally regular, the least depth being 4 fathoms, and the greatest 19 fathoms; the bottom is in most parts sand and mud.

The only known dangers in this channel are the rocks southward, and north-westward of Prudhoe island, the 4-fathoms knolls between Shoal point and l. isle, and the reported Enterprise shoal lying W. by S. $\frac{3}{4}$ S. $6\frac{1}{2}$ miles from Sphinx islets.*

Tidal Streams.—Between capes Hillsborough and Conway, the ebb stream sets to the north-east and the flood to the south-west, but they are very irregular in the direction of the stream; the greatest strength is about 3 knots.

WHITSUNDAY PASSAGE.—The northern termination of the inner channel just described, is bounded to the eastward by Shaw, Dent, Whitsunday, Hook, and Hayman islands; and to the westward, by the shoal extending from cape Conway to Round head, Pine head, Molle isles, and the islets which lie scattered to the eastward of cape Gloucester.

The least breadth of Whitsunday passage is 2 miles, between Dent island and Pine head, *see* pp. 180, 189, to the northward of which it increases to 4, and 7 miles. The soundings, on approaching from southward, increase suddenly at about 3 miles southward of cape Conway, from an 8 and 9-fathoms flat of fine sand and mud, to 20 and 25 fathoms, and even deeper water, on a very coarse bottom.

TIDES.—It is high water, full and change, in Whitsunday passage, at 11h. The shores on either side of the passage being bold, (except near Platypus and Spitfire rocks westward of Shaw island,) may be approached without any other apprehension than may arise from the strength of the streams, which run 3 knots during springs, and the velocity is sometimes

* *See* Admiralty chart, Australia, east coast, sheet XIII., Queensland, Percy isle to Whitsunday island, No. 347; scale, $m = 0.25$ of an inch.

greater. They do not appear to set so strong on the eastern side between Shaw and Dent islands; and the contrary in the vicinity of port Molle. The ebb and flood streams are apparently regular, setting 6 hours each way, the ebb to the northward and the flood to the southward. At port Molle the greatest rise of tide observed did not exceed 10 feet; although Captain King noticed a rise of 18 feet at Repulse isles, and 24 feet at 1. isle.

CHAPTER IV.

CAPE GLOUCESTER TO CAPE MELVILLE.—GREAT BARRIER REEFS.—
INNER ROUTE.

VARIATION IN 1879.						
Cape Gloucester	-	7° 20' E.		Cape Tribulation	-	6° 10' E.
Palm islands	-	6° 45' E.		Cape Melville	-	5° 45' E.
Variation nearly stationary.						

EDGECUMBE BAY* is a deep indentation of the mainland, its entrance extending W. $\frac{1}{2}$ S. 11 miles from the north point of Gloucester island to cape Edgcumbe. The bay is nearly 12 miles deep, and the soundings are very regular, giving timely warning of being near the land.

Ben Lomond, a remarkable sugarloaf hill 1,502 feet high, is near the shore at the head of the bay.

Middle Island, situated near the middle of the entrance of Edgcumbe bay, is rocky, barren, and of a reddish colour, rather flat-topped, 192 feet high, and about three-quarters of a mile long East and West; its southern side is fringed with rocks. There is good anchorage in 6 to 8 fathoms, mud, southward of the island.

Passage Islet is a small rocky islet about 80 feet high, a quarter of a mile off the north-west point of cape Gloucester, connected with the mainland by a sand-bank with a rock on it. The deepest channel in Gloucester island passage is from 200 to 400 yards South of the south-east and south shores of the island.

Three miles southward of cape Gloucester a shallow opening extends some distance eastward into the land; and immediately southward of Ben Lomond a stream of water empties itself into the bay.

Hope and Thomas Islets, on the west side of Edgcumbe bay, southward of port Denison, are $1\frac{1}{2}$ miles apart and half a mile from the shore; the coast from Ben Lomond to these islands is low and covered with mangroves. Between Hope and Thomas islets, is Brisk bay with a depth of 3 fathoms.

Anchorage.—There is good anchorage in 3 to 5 fathoms on the eastern side of Edgcumbe bay, but in the south-east corner there is not more than 3 fathoms at a distance of 3 miles from the head.

* See Admiralty chart, sheet XIV., Australia, east coast, Whitsunday island to Magnetic island, No. 348; scale, $m = 0.25$ of an inch.

PORT DENISON,* is a well-sheltered and commodious harbour on the west side of Edgecumbe bay between 3 and 6 miles southward of cape Edgecumbe. It is sheltered from the eastward by Stone island, which divides the approach to the port into North and South entrances, the latter being the wider and deeper channel.

North Entrance, which is nearly half a mile wide, lies between Stone island and the north point of port Denison. North head is a conical-peaked granite islet, 50 feet high, with a ledge of rocks covered at high water, extending a quarter of a mile south-westward, between which and the north point of the port is a boat passage, nearly $1\frac{1}{2}$ cables wide. South head is a hillock, sloping down into a mangrove gully, in the centre of Stone island. There are 19 to 25 feet water in the outer part of the entrance, and 14 to 18 feet farther in.

Two black nun-buoys mark the 12-feet edge of the reef bordering South head; and two red nun-buoys, the 12-feet edge of the spit extending from Dalrymple point, the north extreme of port Denison; there is also a red triangular topped beacon, 3 feet above high water, on a rock, which dries *one fath* at low water, S.E. by E. $\frac{1}{4}$ E. 2 cables from the extreme of Dalrymple point, and 50 yards inside the outer red buoy. In entering the port, all black buoys are kept on the port hand, and red on the starboard.

The Pilot Station is at North entrance of port Denison, where a *pilot* may be obtained when the sea is too heavy for him to board a vessel outside.

Stone Island is one mile long W.N.W. and E.S.E., and about half a mile broad. There are three small hills on its south-east side, the central and most elevated of which is 86 feet high. Shoal Water bay forms the north-east side, and Observatory point projects from the south-west side of the island. A shoal of coral patches extends half a mile southward from the island, with two red buoys, one on the south-east, and the other on the south-west edge, which will be cleared on its east side, when Holborne island, to the northward, is open eastward of Stone island; and a shoal spit, with a red triangular-topped beacon 6 feet above high water on it, runs out about one-third of a mile from Observatory point.

SOUTH ENTRANCE is $2\frac{1}{2}$ miles wide between the east end of Stone island, and Thomas islet to the southward, which is 30 feet high, and lies East three-quarters of a mile from the low south point of port Denison; but at about a mile within the entrance, the channel, with 3 to 5 fathoms

* See Admiralty plan, port Denison, No. 2,803; scale, $m = 4$ inches. Lieutenant Heath, R.N., Portmaster, Brisbane, says: "This plan appears to show about two feet too much water at low-water springs."

water, is contracted to two-thirds of a mile in width, by the coral patches southward of Stone island, and the coral flat extending from the south shore of the port.

Within the entrances, port Denison contains an area of about three square miles, with $2\frac{1}{2}$ to $4\frac{1}{2}$ fathoms, mud ; but the shores, which are low, and to the southward belted with mangroves, are fronted by a shallow flat, in consequence of which, landing is difficult, except at high water.

A wooden pier, upwards of 2,000 feet long, projects from the town of Bowen in the north-west part of the port ; small vessels drawing not more than 9 or 10 feet, can load and discharge alongside at low water. A tramway runs the whole length of the pier.

Anchorage.—The most convenient anchorages, in 16 or 17 feet water, appear to be at about one-third of a mile south-westward of the north point of port Denison, and at a quarter of a mile north-westward of Observatory point.

Aspect.—The north point of port Denison is a peninsula, which, at high water forms an island, with an abrupt cliff, rising to an elevation of 300 or 400 feet, towards the sea, and gradually sloping down to the mangrove creek, which, at high water, separates this point from the mainland, and communicates with the sea at about $1\frac{1}{2}$ miles northward of North head, when the coast again rises to Edgumbe heights. Between this creek and Town hill, 2 miles to the north-westward of the north point of the port, is some open forest land, where were found some native wells of good water near the shore.

The southern shore of port Denison is backed by mount Gordon, 584 feet high, Middle hill, 309 feet, and mount Bramston, 401 feet high, which bear respectively S.W. by W. $3\frac{3}{4}$ miles, S.W. $\frac{1}{2}$ S. $3\frac{3}{4}$ miles, and S. by W. $\frac{1}{2}$ W. 3 miles from North head. Middle hill, although the least elevated, is the most remarkable when seen from the northward, as it rises to a conical summit, and has table land on each side extending north-westward towards mount Gordon, and eastward towards mount Bramston, these two hills being covered with trees and scrub.

The country near the township of Bowen, and beyond the mangrove swamps, consists of a rich, light, and sandy soil, apparently well adapted to the growth of cotton, and other tropical vegetable productions. An extensive and fertile tract of country, consisting of open bush, is said to extend a considerable distance inland, and to be well adapted for grazing purposes.

Bowen.—The town of Bowen, established in 1861, is on the northern shore of the port about a mile westward of Dalrymple point. There is regular steam communication, fortnightly, with Brisbane and other ports,

and monthly with the mail steamer through Torres strait. The principal exports are wool, tallow, and sugar. Population, 800.

Supplies.—Water is scarce, the supply being drawn from wells in the neighbourhood of the town, or brought in casks from the river Don about 4 miles distant. Fresh provisions can always be procured. Wood is plentiful. Coals can only be obtained from Brisbane. Small repairs can be executed.

TIDES.—It is high water, full and change, at port Denison, at 9h. 30m.; springs rise 6 feet.

LIGHTS.—From a white light-tower 30 feet high on North head, port Denison, a *red* light is shown 110 feet above the sea, and visible 11 miles. The light shows white, with a sector of *red* light between the bearings of S. by E. $\frac{3}{4}$ E. and S. $\frac{1}{4}$ W.; the white light is also seen for a short distance over the land westward of cape Edgecumbe.

A small *red* light is shown from the end of the pier in port Denison.

DIRECTIONS.—There are, as already described, two ways for entering port Denison: North entrance, which is available for small vessels, and South entrance for vessels of greater draught; and this being the wider, deeper, and windward channel, is to be preferred to North entrance.

North Entrance.—A vessel, from the eastward, proceeding for port Denison by North entrance, may, on rounding the north point of Gloucester island, at the distance of about a mile, steer W.S.W., and having passed at about one-third of a mile northward of Middle island, haul up more to the southward, and bring Middle hill midway between North and South heads of the entrance, bearing S.W. $\frac{1}{4}$ S., which course, between the black buoys on the port, and the red buoys on the starboard hand, will lead through the deepest part of the channel, carrying not less than $13\frac{1}{2}$ feet at low-water springs. After carefully avoiding the spit off Dalrymple point, and having rounded the second red buoy, the vessel may proceed north westward, for the township, or to the anchorage north-westward of Observatory point.

South Channel.—After rounding the north point of Gloucester island at about the distance of a mile, haul up S.W. by S., making due allowance for tide, until the south-east extreme of Stone island is in line with mount Gordon. Then steer S.W. by W. $\frac{1}{4}$ W. for mount Bramston, keeping it on that bearing until Town hill bears N.W. $\frac{1}{4}$ W., when the vessel will be in the fairway of South entrance, in 4 to $4\frac{1}{2}$ fathoms, and may proceed north-westward into the port. As soon as North entrance is open, haul up and anchor according to the depth of water.

Or, after rounding Gloucester island, steer S.W. $\frac{1}{4}$ S. until Mackenzie peak is open southward of Middle hill, which, kept open, will lead into

South entrance, clear of the shoal extending southward from Stone island ; and when North head opens westward of Stone island haul up for the anchorage.

Vessels entering Edgcumbe bay from the northward and westward should be careful not to approach within a mile to the north-eastward of cape Edgcumbe.

Masters of sailing vessels are cautioned against the very heavy squalls which come off Gloucester island during heavy south-easterly weather. When *close in* under the island, these squalls pass over a vessel and are not felt, but at a distance of from one to 3 miles they are dangerous, and every precaution should be taken when coming under the lee of the island.

During northerly winds it may often be a considerable saving of time to vessels of light draught bound to port Denison, to pass through Gloucester passage, instead of rounding the north end of Gloucester island. The following directions will enable vessels to use this passage without difficulty :—After passing Saddle-back island steer for the south-easternmost point of Gloucester island keeping the outer shoulder of Hook island open of the east end of Saddle-back island, until within a cable's length of Gloucester island ; keep the Gloucester island shore on board at about half a cable's distance until abreast a white beacon on this island, when haul up, keeping Passage islet a little on the starboard bow, and passing a dangerous rocky patch, which is marked by a black beacon on the port hand, for which, during flood tide, a good look-out must be kept. Continue this course, making due allowance for tide, until the northern point of cape Gloucester is in line with the east end of Saddle-back island, then keep away and round Passage islet at a distance of half a cable. Keep along the western side of the islet, not approaching within half a cable, until the north point of cape Gloucester is open of Passage islet, when a W. $\frac{1}{4}$ N. course may be shaped for the entrance to port Denison. By these directions, a vessel should pass through with about 7 feet at low-water springs.

In passing through to the eastward, when keeping the northern point of cape Gloucester and the north end of Saddle-back island in line, keep away for the white beacon on Gloucester island, as soon as the two westernmost points of this island are shut in.

Unless the wind leads through the channel it would be necessary for a sailing vessel to have a fair tide, as the stream sets through at the rate of about 2 knots at springs—the ebb setting into Edgcumbe bay, and the flood in the contrary direction.

By Night.—Vessels bound to port Denison from the eastward should steer so as to pass outside Middle island at a safe distance, and when the light on North head bears S.W. steer for it until the passage between

Stone island and North head can be distinguished, when steer S.W. by S. for the channel, keeping nearer to North head, which is almost steep-to; keep a look-out for the two black buoys off Stone island, which are to be left on the port hand; continue the S.W. by S. course for about a mile inside of North head, the red light on the jetty head will then bear about N.W. by W., when a vessel may anchor according to her draught of water.

Vessels from the northward, passing at least $1\frac{1}{2}$ miles northward of cape Edgecumbe should steer south-eastward and pass through the arc of red light, the light opening out as a bright light on a S. $\frac{1}{4}$ W. bearing, when they will be clear of the outlying dangers off cape Edgecumbe, and may keep away for North entrance, being careful not to open out again the red light, and may enter as before directed.

Vessels, during dark boisterous weather, with the wind from the southward or eastward, not wishing to enter the port at night, should keep within half a mile of Gloucester island, as it is steep close to, and by making a tack they will be able to select, by the lead and smoothness of the water, a convenient anchorage in from 7 to 4 fathoms under the island.

A stranger must not be alarmed when steering across Edgecumbe bay, at seeing light patches very much like shoal water; as Lieutenant Heath always found the water 2 or 3 feet deeper within, than about them. He therefore thinks they are caused by the tide sweeping the mud from parts of the white pipe-clay bottom beneath.

Holborne Island, N.N.W. $\frac{1}{4}$ W. 16 miles from Gloucester island, is a cliffy inlet 385 feet high and visible at a distance of 20 or 25 miles. It has deep water on its north-east side; on its south-west side is a coral reef and sand-bank, the extent of which has not been determined; but from an observation from the top of the island, with the sun to the northward, no danger was seen farther than one quarter of a mile off the land; on the south-east side one quarter of a mile distant is a rock 40 feet high and 200 yards long, connected with the island by a coral reef; and $2\frac{3}{4}$ miles S. $\frac{1}{4}$ E. is Nara rock 30 feet high and 200 yards in diameter, with deep water around.

The COAST from cape Edgecumbe, off which rocks above water extend half a mile, forms a low shore for 12 miles W.N.W. to Abbott point; at $8\frac{1}{2}$ miles southward of the point, mount Round back, 2,580 feet high, rises from the low land. Shoal water borders this part of the coast, and 4 miles westward of cape Edgecumbe, runs off $1\frac{1}{2}$ miles from the shore.

Abbott Bay is nearly 13 miles broad, from Abbott point W.N.W. to the eastern part of cape Upstart, and about 6 miles in depth. Clark shoal, upon which there is as little as $1\frac{1}{2}$ fathoms, projects north-westward from

Abbott point, but the limits of the shoal have not been ascertained. The shores of the bay are low, and intersected by two creeks, one in the eastern part of the bay forming the outlet to a lagoon of brackish water on the low land southward of Abbott point; the other communicating with Upstart bay, to the north-westward. There are two rocky islets in the bay, lying W. $\frac{1}{2}$ S., the one $5\frac{1}{2}$ miles and the other 9 miles from Abbott point; a 3-fathoms patch lies one mile to the south-eastward of the former islet.

From these islets to cape Upstart, the depth of water is regular, increasing from 5 to 11 fathoms.

Anchorage.—There appears to be sheltered anchorage for small vessels, in 3 and 4 fathoms water, on the eastern side of Abbott bay, between the rocky islets and the shore.

CAPE UPSTART was very appropriately named by Captain Cook, from the remarkable abruptness with which it rises from the low swampy ground, which is separated from the mainland by the creek between Abbott and Upstart bays. The high land of the cape extends $6\frac{1}{2}$ miles East and West, and 4 miles across, and is chiefly composed of a mass of granite rocks, scantily covered with stunted trees and scrub. Its summit, which is somewhat table-topped, is severed by a deep gorge across it. Station hill, the highest part of cape Upstart, near the south-west extreme of the heights, is 1,900 feet above the level of the sea.

Immediately to the southward of a large rock above water, close off the north-west point of cape Upstart, is a small sandy bay, with a piece of level ground extending across to the opposite side, on the extreme point of which is a rocky pinnacle.

Anchorage.—There is secure anchorage, in from 4 to 7 fathoms water, close off the small sandy bay just mentioned, and a convenient landing-place on the beach.

Water.—At about a mile southward of the anchorage, is a creek leading into the western end of the gorge already noticed as intersecting cape Upstart, where was found a small quantity of water in the month of March, just above high-water mark, and a much larger supply in a hole about 140 yards up the gully; from this hole H.M. Ships *Fly* and *Bramble* watered without much difficulty, as the approach to it from the shore was over smooth grassy ground. At nearly a quarter of a mile up the ravine, was discovered a large basin between the granite boulders, upwards of 20 feet long, containing pure water, more than 10 feet deep. After some heavy rains in the early part of April, the ravine became the channel of a mountain torrent; but in December no water was found.

The shore between the anchorage and watering-place is low, and partially covered with mangroves, fronted by coral flats, which greatly obstruct communication with the watering-place, especially at low water.

TIDES.—It is high water, full and change, at cape Upstart, at 9 h.; springs rise 6 feet.

ASPECT.—Mount Abbott, $23\frac{1}{2}$ miles to the southward of cape Upstart, is remarkable, and about 3,500 feet high. From mount Aberdeen, which is E.S.E. of mount Abbott and 3,250 feet high, a rocky mountainous range extends south-eastward to within 7 miles of the west side of Repulse bay. Between the base of this range and the shores of Edgcombe bay, and the low marshy land to the westward of the hills, from mount Dryander to cape Conway, is a considerable tract of low land. The range next recedes from the coast, taking a more southerly direction to a high rounded summit at about W. by S. 24 miles from cape Hillsborough, and which, being 4,625 feet high, is visible at a distance of fully 60 miles; between this part of the range and the coast, are several ridges, gradually decreasing in altitude as they approach the shore.

Upstart Bay, an indentation of the flat country immediately to the westward of cape Upstart, is 10 miles broad East and West, and 8 miles in depth. The mangrove shore forming the bight, is intersected by numerous salt-water creeks, with shoals extending a considerable distance from their mouths. The bay has not been minutely surveyed, but a line of soundings across, within the entrance, showed an average depth of 7 fathoms water.

Wickham River flows into Upstart bay at $9\frac{1}{2}$ miles westward of the cape, and is fronted by a bar with two small islets on it, at 2 miles within which is a larger islet, lying in the mouth of the river. Being on a lee shore, the sea generally breaks so heavily on the bar at all times of tide, as to render the entrance difficult, and even dangerous, for a boat to pass through. A surveying party from the *Fly*, who went up the river in 1843, would have found it impossible to get out again, had they not discovered a narrow passage winding 3 miles through the mangroves out to sea, at a little northward of a small rocky hillock, about 3 miles southward of the broader entrance. On the west side of this hillock a small creek trends to the southward.

Captain J. C. Wickham, who first discovered the river, found the water fresh, 10 miles above the entrance, but at that point the stream was nearly lost in sand, and so very shallow, that the natives have a fishing weir across it. The land, which appears to be much cut up with creeks, is very flat, and the banks of the river are not more than 5 or 6 feet above high-water mark, the whole being subject to inundations; this was evident from the signs of drift which he saw, at the height of 6 feet, on the trees which grew along the banks.

At 3 miles north-westward of the entrance is a small creek, apparently blocked up by a continuation of the bar, extending upwards of 9 miles along the low shore towards cape Bowling-green.

CAPE BOWLING-GREEN—or, as it would be more correctly expressed, Bowling-green point—is the north extreme of an extensive, low, level projection of the mainland, N.W. 30 miles from the north-west point of cape Upstart. On the eastern side of the cape is a long continuous sandy beach, fronted, from about a quarter to half a mile, by a ridge of small sand-banks partly dry at low water; a depth of 4 to 6 fathoms will be found about 2 miles from the shore. The land above high water is covered with low scrub and long grass. From the northern extreme of the cape shoal water extends half a mile, and appears to be steep to, but as the sands are liable to change, the point should not be approached within a mile.

A low sandy islet, covered with scanty herbage, lies W.S.W. from the cape, its western point being 3 miles from the lighthouse. Between the islet and the cape are banks of shifting sands, through which, at high water, are several boat channels.

LIGHT.—On cape Bowling Green a *revolving* light is exhibited, attaining its greatest brilliancy *every minute*; the light is 70 feet above the mean level of the sea, and visible for a distance of 14 miles. In consequence of the encroachment of the sea upon the cape, the lighthouse had in 1878 to be removed 120 yards south-west of its original position.

DIRECTIONS.—Cape Bowling-green being very low, without any eminence within 20 miles of it, would be very difficult to approach with safety, particularly at night, were it not for the good guiding marks afforded by capes Cleveland and Upstart, and mount Eliot, together with the light upon the extreme of the cape; but when these cannot be seen, great attention must be paid to the lead in passing the cape, which should not be approached within a depth of 11 fathoms, and in directing a course from cape Upstart, a vessel should be steered sufficiently to the northward to provide against the current, which sets into Upstart bay. In approaching cape Bowling-green from the eastward, if the soundings are less than 11 fathoms, the vessel must be hauled off shore, because she would then be on the same parallel with, or to the southward of that cape. From the westward, after rounding cape Cleveland, a depth of not less than 10 fathoms should be maintained until well eastward of cape Bowling-green.

Aspect.—Mount Eliot is a level-topped mountain, forming the south extreme of a group detached from the main range; its summit is $3\frac{1}{2}$ miles long North and South; the peak at the north end is 4,060 feet high. Immediately adjoining on the western side is a hilly mountain 3,600 feet high. From 3 to 6 miles N.N.E. is a third level hill, 2,860 feet high, completely separated from mount Eliot by a low narrow pass. Mount Stuart 14 miles N.W. by W. from mount Eliot, forms the north-west extreme of this

detached range; it is a smooth-topped hill rising to a peak 1,875 feet high, sloping gradually down to the south-east. Mounts Eliot and Stuart are connected by a lower range of hills, one being 985 feet high. These hills rise from a perfectly level plain on their north and east sides, and no connection with the main range was seen on the south-west side.

Between the last-named range and cape Cleveland hills are two remarkable cones; the northernmost one, 805 feet high, shows as a prominent object from the northward; the southernmost (Feltham cone) is 900 feet high, and lies 6 miles S.E. of North cone, and 7 miles N.E. $\frac{1}{2}$ E. of mount Eliot peak; it is a most valuable and conspicuous mark, from the north and from the eastward, both stand up out of the plain clearly separated from the other high land. With the exception of a small hill 2 miles North of Feltham cone, a low plain fills up the gap between mount Eliot and Bowling-green bay to the east and cape Cleveland range to the north.

From an opening in the hills on the west side of mount Abbott, the barren range, which has almost uninterruptedly continued from the back of cape Palmerston, a distance of 150 miles, trends to the westward and then recedes or terminates at about 15 miles southward of mount Eliot.

Bowling-green Bay, lying between capes Bowling-green and Cleveland, a distance of 26 miles W. by N., is about 11 miles deep; but shoals, with irregular depths of one to 5 fathoms on them, occupy the greater portion of the bay, stretching out northward to a line extending W. $\frac{1}{2}$ N. from cape Bowling-green. The eastern side of the bay consists of a mass of tangled mangrove swamps, faced by extensive mud-flats. Nearly half way across the bay from its eastern side, there are only 6 to 12 feet water between 4 and 7 miles from the south shore; but to the westward of these shallows the south shore may be approached within 4 miles in 4 to 5 fathoms water.

The Central Mouths of Burdekin River are two entrances of this river, one in the south-east and the other in the south-west bight of Bowling-green bay.

The East Central mouth has a bar across it, dry at low water, within which the stream is divided into numerous intricate channels by small mangrove islands. From 4 miles above the bar the stream winds 9 miles through open forest and grassy land, to where it is brackish at low water.

The West Central mouth, 13 miles to the westward of that just described, is flanked by a bank extending 2 miles from the entrance, having a narrow channel on its western side, where there is a depth of 4 fathoms, with a 6 foot bar outside it. From the north-west point of this mouth of the Burdekin a narrow channel, carrying from one to 2 and $3\frac{1}{2}$ fathoms, trends S.E. and then S.W. $1\frac{1}{2}$ miles to the south-east entrance of Crocodile Bay, where which the stream winds through grassy and open forest land 2 miles, where the water is nearly fresh at half flood. At about $3\frac{1}{2}$ miles

below this there is a depth of 2 fathoms. Numerous young crocodiles were seen on the banks of this river.

The coast between the Central mouths of Burdekin river is nearly straight, and intersected by creeks, the land at the back being from 5 to 10 feet high.

CAPE CLEVELAND is a headland rising from the open forest plain which is separated from the mainland by Crocodile creek. The north extreme of the cape forms a narrow hilly point, 205 feet high, whence the high land extends $6\frac{1}{2}$ miles to the southward, and consists of three hills, the highest being 1,800 feet above the sea, with ridges descending to the north-westward.

Some reefs, marked by a rock 4 feet above water, lie eastward of cape Cleveland; Salamander reef, the outermost of these dangers, is E. $\frac{1}{2}$ N. 3 miles from the extreme of the cape, and is awash at low water. Deep water appears to exist between the rocks and the shore, but as the locality has not been closely examined, vessels should pass outside. To clear the reefs, the south extreme of Magnetic island must be kept well open of cape Cleveland, bearing W. by S.; and Feltham cone, a well defined peak, 900 feet high, standing by itself on the plain East of mount Eliot, open east of the small islet $3\frac{1}{2}$ miles eastward of the cape.

Three rocks above water lie within one mile of the eastern side of cape Cleveland, the central and most distant rock from the shore lying E. by S. $\frac{3}{4}$ S. $3\frac{3}{4}$ miles from the north extreme of the cape.

Anchorage.—There is good anchorage in strong S.E. winds westward of cape Cleveland in 3 fathoms, Small Sugarloaf completely open north of Red-cliff point; the north extreme of the cape must not bear north of E.N.E.

CLEVELAND BAY, immediately on the west side of cape Cleveland, extends W. $\frac{3}{4}$ S. $13\frac{1}{4}$ miles to cape Pallarenda, and is $6\frac{1}{2}$ miles deep; the south part is very shallow, the 3-fathoms line of soundings, extending from one-third of a mile off cape Cleveland towards Castle hill, is $4\frac{1}{2}$ miles distant from the low land at the bottom of the bay; but there is deep water on the western side of the bay formed by Magnetic island, the east end of which may be approached as near as 200 yards with 5 fathoms water; the south point of the island has a reef and shoal water running off it, but there are 3 fathoms water half a mile South of it.

The N.W. Mouths of Burdekin River are three creeks which communicate with Cleveland bay between 5 and 9 miles south-westward of the north point of cape Cleveland. The central, which forms the north-western entrance of Crocodile creek, carries 3 to 4 fathoms for 5 miles up from the entrance; but it is fronted by a flat, with 6 to 12 feet water, extending 2 miles from the shore.

From the western of the N.W. mouths of Burdekin river the low coast sweeps round north-westward to cape Pallarenda, and is intersected midway by Ross creek trending to the south-west, close to the north-westward of which is Castle hill.

TOWNSVILLE is built on the south-east slope of Castle hill, which is 935 feet high, with a cliff on its north-east side rising out of the plain, and immediately on the north bank of Ross creek. Although only founded in 1864, it is a flourishing place, and being the port from whence supplies are forwarded to the gold fields of Ravenswood, Etheridge, &c., has a considerable trade with Brisbane and Sydney, principally carried on by steamers. The Torres Straits mail steamers also call here. Townsville contains a custom house, hospital, town hall, and theatre, and in 1873 the population numbered 1,140.

Extensive works have been undertaken to improve Ross creek; a stone breakwater joins Magazine island to the mainland, east side of entrance to the creek, and from the west side of the island a stone and screw pile jetty is being extended in a northerly direction for about 2,000 feet.

The centre of the channel into the creek is marked by six large black warping buoys, the outermost of which lies in 8 feet at low water. The water gradually shoals thence to the third buoy, which is on the bar and is dry at low-water springs. Inside the bar, the channel (which is continually shifting) is marked by buoys and beacons as may be from time to time necessary. This channel is 100 feet in width, but with a depth of water less by one foot than that upon the bar. After entering the next reach, which runs in the direction of Castle hill, the creek carries nearly the same depth across, from 5 to 7 feet at low water, as far as the town. A little beyond, on the north shore, is a rock which dries at low water. There are several wharves at which small vessels can take in and discharge their cargoes.

When vessels require to enter the creek at night, a white light is exhibited from a beacon on the port hand, and a *red* light from a beacon on the starboard hand, to guide them over the bar and into the channel.

The following Tidal signals are made from the flagstaff on shore when vessels require to cross the bar, viz. :—

Depth of Water.	Day Signals.	Night Signals.
feet in.		
6 0	Ball at mast-head - - - -	Red light.
6 6	„ half mast-head - - - -	Green light.
7 0	„ east yard-arm - - - -	Red light over white.
7 6	„ east yard-arm, dipped - - -	Red light under white.
10 0	„ west yard-arm - - - -	Green light over white.
8 0	„ west yard-arm, dipped - - -	Green light under white.
9 0	„ mast-head and east yard-arm -	Red light over green.
9 6	„ mast-head and east yard-arm, dipped	Red light under green.
10 0	„ mast-head and west yard-arm -	Two red lights, vertical.
10 6	„ mast-head and west yard-arm, dipped	Two green lights, vertical.
11 0	„ each yard-arm - - - -	Two red lights, horizontal.
8 0	„ east yard-arm, and dipped at west yard-arm.	Two green lights, ditto.
9 0	„ each yard-arm, dipped - - -	Red and green lights, ditto.

The flood tide will be distinguished by a red burgee at the mast-head ; when a ball is shown at the mast-head, the burgee will be hoisted below the ball.

If the yard-arms are occupied by shipping signals, the Tidal signals will be made from the quarters of the yard instead.

Trade.—In 1872 the value of the customs receipts amounted to 61,600*l.* and of the exports and imports to 609,109*l.*

Supplies of all kinds are easily procured, but it is difficult to obtain water in any large quantity.

LIGHT.—A *red* beacon light is exhibited from the outer end of the jetty or breakwater, on the west side of the entrance to Ross creek.*

TIDES.—It is high water, full and change, in Cleveland bay at 9h. 30m. ; the rise at springs is from 5 to 10 feet, but during S.E. winds it occasionally exceeds this.

ANCHORAGES.—Small vessels will find good anchorage in 2 fathoms at low-water springs, with Magazine island bearing S. by W. one mile ; Castle hill S.W. by W.

Vessels of heavier draught should, in moderate weather, anchor outside the black buoy, which lies in $2\frac{1}{2}$ fathoms, $1\frac{1}{2}$ miles from the shore. Inshore of the buoy the water shoals more quickly, and the holding ground cannot be depended upon.

There is a sheltered anchorage in 3 fathoms water, West of Magnetic island, $4\frac{1}{2}$ miles from the town, with Hawkings point, Magnetic island, E. by N., and Castle hill S. $\frac{1}{2}$ E.

There is also good anchorage for large vessels well sheltered from N.E. winds, under Magnetic island in 4 fathoms water ; West point of Magnetic island bearing N. by W. ; South point ditto, E. by S. $\frac{1}{2}$ S. This anchorage is 6 miles distant from the town.

MAGNETIC ISLAND, lying $2\frac{1}{2}$ miles north-eastward of cape Pallarenda, is nearly of the form of a triangle ; it is $5\frac{1}{2}$ miles long, East and West, and $4\frac{3}{4}$ broad. The numerous peaks with which the island is studded are thickly wooded and covered with immense granite boulders, especially those at the north-east end. The highest peak, in the centre of the island, is 1,700 feet high ; and is separated from the range of hills at the east end by a valley running across the island, at the south side of which fresh water will always be found half a mile from the beach. On the west side of the island is a plain fringed with a line of mangroves, and from the shore a coral reef extends along the whole of it, the reef is about a mile broad in its widest part, abreast of cape Pallarenda, but gradually

* During the construction of a jetty at Magazine island, a *fixed* red light elevated 15 feet above high water, will be exhibited from the outer end of the works.

narrows towards the west point of the island. A black buoy is moored half a mile outside the southern end of this reef, with Hawkings point bearing N.E. $\frac{1}{4}$ N., one mile distant. The north-west point of the island and the north and east shores are high, rocky, and steep-to, with deep water close in. The bays on the south-east shore are filled up with coral reefs extending across in a line with the points.*

White Rock, about 20 feet high, 50 yards off a point half way along the north shore of Magnetic island; and—

Orchard Rocks, about 50 feet high, 300 yards north of the north-east point of the island, are remarkable boulders of granite forming conspicuous marks from seaward.

Bay Rock, about 80 feet high and 200 yards in diameter, is $1\frac{1}{4}$ miles W. by N. of the west point of Magnetic island, with 5 fathoms water within 200 yards of it. There is a sheltered anchorage between Bay rock and the island, care being taken not to get too close to the west point of the island.

Virago Rock, situated nearly midway, and a little outside a line drawn between cape Pallarenda and Red-cliff point, is a coral reef 3 cables long N.W. by N. and S.E. by S., and one cable broad, awash at low-water springs. From its centre Hawkings point bears N.E. by E. $3\frac{1}{4}$ miles. A small red buoy is placed in 2 fathoms at low-water springs, $3\frac{1}{2}$ cables E.N.E. of the rock.

Magnetic Island West Channel.—In the middle of the south end of this channel is Middle bank, a detached coral reef three-quarters of a mile long N.W. and S.E., with a clear channel on both sides; the channel east of the reef, although having 3 or 4 feet deeper water than the other, is only half a mile wide, having a steep coral reef on each side, neither of which uncover except at low-water springs; the lead gives no warning of danger. The channel west of the reef, the deep water of which is three-quarters of a mile broad, is well marked by two black buoys, which are moored off either end of the Middle bank, and by the Virago rock buoy. There is also another black buoy with a white flag on it, moored in $2\frac{1}{2}$ fathoms water, about half a mile northward of the north buoy of the Middle bank. The buoys are only moored with stones. The two channels uniting north of the Middle bank give a 2-fathoms channel, one mile broad, with gradually deepening water in the centre, having on the east side the steep coral reef which extends one mile from the shore of Magnetic island, and the gradually shoaling water on the west or mainland side.

See Admiralty chart of Australia, east coast, sheet XV., Magnetic island to Double point, and the Barrier reefs, No. 2,349; scale, $m = 0.25$ inch.

A shoal which dries at low-water springs, extends $1\frac{1}{2}$ miles from cape Pallarenda in a northerly direction, and the 2-fathoms line of soundings is 2 miles from the cape. A red buoy is moored outside the shoal.

Leading and Clearing Marks for West Channel.—Cordelia rock in a line with Bay rock N.W. by N., or mount Eliot peak, over the west extreme of Red-cliff island S.E. by S., leads through the deepest channel until the Middle bank is approached.¹

To clear the west reef of Magnetic island; Bay rock in line with the centre low part of Acheron island N.W. $\frac{1}{4}$ N.

North extreme of cape Pallarenda shoal; South peak of cape Cleveland touching Nobby head E.S.E.

DIRECTIONS for CLEVELAND BAY.—After rounding cape Cleveland, the north extreme of which may be approached within half a mile, steer for Castle hill: as the mainland is approached two reddish cliffs will be seen, the south-easternmost of which is Red-cliff island, west of which is Ross creek.

Vessels entering Cleveland bay from the northward, between Magnetic island and cape Pallarenda, should, after leaving the Palm islands, steer for the Bay rock at the entrance to the channel, and pass midway between it and Magnetic island. When abreast the rock, haul up and steer for Red-cliff point, bringing it in line with a dip in the mainland at the back, passing the red buoy off cape Pallarenda and that off the Virago rock, on the starboard hand, and a black buoy with a white flag upon it and the two black buoys marking the Middle bank on the port hand. Keep these marks on until Castle hill bears S. by W., and then haul up E. by S. $\frac{1}{2}$ S., which course will bring a vessel near the black buoy lying in 15 feet low water, off Townsville, when she can take up her anchorage according to her draught of water.

Vessels working through this channel will be clear of Virago rock while keeping a small flat island, to the north-west of cape Pallarenda, well open of cape Pallarenda. When abreast the reef, a remarkable basaltic pinnacle on the main range is on with the eastern saddle of the high land near the coast.

CAPE PALLARENDA is the eastern extreme of a detached range of hills extending $3\frac{1}{2}$ miles East and West; the highest peak (mount Mary peak) 5 miles N.W. of Castle hill, is 750 feet high. It is named Marlow hill by the people in the locality.

The MAIN RANGE.—13 miles S.W. of Castle hill are two well-defined white-topped hills on the main range, separated from mount Stuart; from these peaks the hills trend in a north-west direction for 68 miles without any apparent pass, the hills ranging from 1,580 to 3,425 feet high. About 14 miles W. by S. from Castle hill is a sugarloaf hill

1,350 feet high, rising from a spur of the main range; it is a valuable mark from the offing; 3 or 4 miles at the back and to the westward, are two well-defined peaks 2,445 feet high; north of this there are no prominent marks from seaward, except the lowest part of the range, which is 28 miles W. by N. of cape Pallarenda, and 1,580 feet high.

An extensive plain extends from Castle hill and Marlow hill to the westward, towards the main range, broken occasionally with sugarloaf hills, the nearest of which, 430 feet high, is $6\frac{1}{2}$ miles W. by S. of Castle hill, and is a conspicuous mark from the eastward.

HALIFAX BAY extends from cape Pallarenda to a broad mangrove point forming the south side of the south-eastern entrance of Rockingham channel, a distance of 46 miles N.W. $\frac{1}{4}$ N., and is nearly 14 miles deep; but it has not been closely surveyed, and being a lee shore, it affords no sheltered anchorage from the eastward.

As the shores of Halifax bay appear never to have been closely examined, it would not be prudent to approach the land in less than 9 or 10 fathoms water, without due caution.

The high range of hills which rise abruptly from the low land at the back of the coast, in the southern part of the bay, extends in a north-westerly and northerly direction, to mount Leach, 2,750 feet above the sea, and lying about 13 miles to the westward of the entrance of Rockingham channel. The nearest part of this range to the sea, is Round hill, at about 6 miles from the shore, in the bight of Halifax bay. The low land between the base of the range and the sea, is wooded and apparently much occupied by lagoons.

The **PALM ISLANDS** are a group of some 20 islands and rocks, lying off Halifax bay, midway between Magnetic and Hinchinbrook islands. The southern cluster consists of Achéron, Rattlesnake, and Herald islands, with Cordelia and Bramble rocks.*

Cordelia Rock, $8\frac{1}{2}$ miles N.W. by N. from Bay rock (page 214), is clifly, 83 feet high and 200 yards in diameter, having a detached rock 12 feet high 150 yards E.N.E. of it; the two are connected by a coral reef, which extends under water 300 yards to the east and west of them, forming altogether a patch half a mile long and one quarter of a mile broad; there is deep water all round the reef.

HERALD ISLAND, 3 miles S.W. $\frac{1}{2}$ W. from Cordelia rock, is three-quarters of a mile long, and has two low rounded grassy hills, 155

* In 1848, the *Will-o'-the-Wisp* (a small cutter from Sydney, in search of sandal-wood), when at anchor at night, under the lee of one of these islands, was attacked by the natives; the master and one of the crew were severely wounded, and the vessel nearly captured, and set on fire, by throwing wads of burning bark into the hold.

and 160 feet high. A sand-spit runs 300 yards from the south-west part of the island; the east shore is steep-to, with 5 fathoms water close to the rocks; but a coral reef extends 200 yards from the south and west shores.

RATTLESNAKE ISLAND lies half a mile W.S.W. from Herald island, is $1\frac{1}{2}$ miles long East and West and has a single rounded grassy hill 375 feet high, with two small cones rising from its western base; a coral reef runs off 200 yards on the south and western shores, extending to 400 yards off the west point; but the north coast has 3 fathoms water within 200 yards of the shore.

Bramble Rocks, 10 feet high, are midway in the north part of the channel between Herald and Rattlesnake islands; the reef surrounding them is one-third of a mile in diameter, leaving a narrow 4-fathom passage on each side, in which there is a strong tide race.

Lorne Reef.—This sunken reef, discovered by the master of the schooner *Marchioness of Lorne* in 1874, lies $1\frac{1}{2}$ to 2 miles W.S.W. of the north-west point of Rattlesnake island. Vessels passing in the vicinity of this danger should exercise great caution.

Acheron Island, 3 miles N.W. by W. from Cordelia rock, and $3\frac{1}{2}$ miles North from Herald island, is nearly a mile long East and West; it has a rocky hill at each end 195 and 215 feet high, with low land between, on which is a small hillock. A sand-spit runs 300 yards from the west extreme of the high land. A coral reef extends 100 yards off the south shore, and 200 yards off the west shore; the cliff at the east end has deep water close-to.

In clear weather this island in a line with Bay rock is a leading mark for entering Cleveland bay by the West channel.

Phillips rock, discovered by the master of the *Florence Irving* in 1877, reported to have only 3 feet on it at low water springs, and half a mile East and West in length; with the west end of Acheron island bearing N. E. $\frac{1}{4}$ N., and Cordelia rock E. by S.; the water deepening gradually on its eastern side, while to the north-westward the depth increases suddenly from 3 feet to 4 fathoms, dead coral and sand bottom.

GREAT PALM ISLAND, 22 miles N.W. by N. from Magnetic island, is $8\frac{1}{2}$ miles long, S.E. by E. and N.W. by W., and from 2 to 4 miles broad, it is thickly wooded in all parts. The highest hill is 1,890 feet high, and nearly in the centre of the island; the main ridges descending in three directions, S.W., East, and N.N.W.; the S.W. ridge has two remarkable cone peaks, which are prominent marks from the offing, the easternmost, nearly a mile from the summit of the island, being 1,775 feet high, and the other, Torch peak, half a mile S.W., 1,350 feet high; the high land then descends abruptly into a low plain 2 miles from the summit, from which

two round-topped wooded hills rise to form the south-west point of the island, named Miranda point.

When seen from a distance Miranda point appears as an island, and Torch peak shows as the west extreme of the Great Palm island. The east range has an ill-defined peak 1,650 feet high midway between the summit and the S.E. cape. The N.N.W. range has no well-defined peak, but a gap occurs three-quarters of a mile S.E. of Calliope point, the north extreme of the island. Calliope point shows as a rocky cliff from seaward; there is deep water close to the rocks.

Elk Cliff is $1\frac{1}{2}$ miles E. by S. of Calliope point; the intermediate bay has a reef extending 300 yards from the beach, but the cliff itself has deep water close to the rocks. The coast between Elk cliff and Electra head, $6\frac{1}{2}$ miles S.E. by E. $\frac{1}{2}$ E., has not been closely examined, but there is no apparent danger beyond the reef skirting the shore.

Curaw island, immediately N.W. of Calliope point, kept open of Elk cliff will lead well clear of all dangers.

Electra Head is a bold steep headland about 500 feet high, with deep water close to the rocks.

South-east Cape, $1\frac{1}{2}$ miles S.S.E. of Electra head, is a cliffy point about 300 feet high, with rocks running off 200 yards to the southward; a strong tide race extends one quarter of a mile off the cape.

Hayman Rock is one-third of a mile off Electra head, with deep water between it and the land; it is awash at low water and does not break at high water, except in very bad weather. There is a 7-fathoms, patch half way between Hayman rock and South-east cape, one-third of a mile from the land.

White Rock, $1\frac{1}{2}$ miles E.S.E. from South-east cape, is 78 feet high and 900 yards in diameter, with deep water within 100 yards all round it.

Whilcott Rocks, one mile South of White rock, and 2 miles S.E. of South-east cape, are two small rocks 20 feet apart, the north one is 5 feet above high water; there is deep water close alongside of them.

Harbor Islet, 2 miles S.W. by W. from South-east cape, is 85 feet high and 300 yards long East and West; it is thinly wooded; a coral reef extends 300 yards North, towards the mainland, leaving a passage one quarter of a mile wide, with no apparent dangers, but the coast has not been closely sounded.

Tawn Head, a steep bluff headland, thickly wooded, is one mile West of Harbor islet; a reef extends 50 yards from the beach, but there is deep water within 200 yards.

Miranda Point, the south-west point of the island, is 4 miles West of Tawn head; the intermediate coast is broken into three shallow bays,

with coral reefs running across from point to point, the 5-fathoms line of soundings is one-third of a mile from the land. The south extreme of Barber islet in line with Fawn head will ensure a depth of 9 fathoms, but the point may be approached to within 200 yards with 5 fathoms water.

West Coast.—Between Miranda and Calliope points there are a succession of sandy bays fringed with a coral reef, which extends the whole length of the island, generally half a mile off the beach, but half way along the coast, where the shore recedes, it is a mile from the bottom of the bay. As Calliope point is approached within 2 miles there are some dangerous detached patches one quarter of a mile off the main reef.

Challenger Bay extends 4 miles North and South, from a point one mile northward of Miranda point to the south part of Curaçoa island; the south point of Challenger bay in a line with Miranda point, will clear the reef off the west coast. There is good anchorage in the bay in 6 fathoms, sheltered from the south-east winds.

Water is found all the year round at the base of the hills in the flat luxuriant valleys on the west side of the island, but is at too great a distance from the beach for convenient watering.

ECLIPSE ISLAND, one-third of a mile long, lies one mile S.W. of Miranda point, Great Palm island, with a clear deep channel on each side of it. A flat-topped hill 187 feet high slopes down to a sand-bank at the north-west end, and a coral reef extends one-third of a mile to the northward, but the east, south, and west shores have deep water within 200 yards.

Falcon Island, three-quarters of a mile West of Eclipse island, is three-quarters of a mile long, and one quarter of a mile broad, with a rounded woody hill 217 feet high, sloping down to a sand-bank at the north-west end, off which a coral reef extends for 200 yards; there is deep water 200 yards off both the east and west shores.

Brisk Island, three-quarters of a mile S.W. of Eclipse island, is a mile long; it has a round woody grassy hill 200 feet high, sloping down to a sand-bank at the north-west end, which at low water extends to within 200 yards of Falcon island; a coral reef connects the islands, leaving a boat passage at high water; the same reef extends 200 yards off the north-east and west sides of the island, but the south end has deep water within 100 yards.

Esk Island, half a mile West of Falcon island, is half a mile long with a low wooded hill 187 feet high; a reef runs 200 yards from the south-east end of the island; but the east, north, and west shores have deep water within 300 yards. There is a deep clear channel on each side of the island.

DIDO ROCK, half a mile S.W. of Esk island, is about 15 feet above high water, surrounded by a reef which extends to the N.W. for one-third of a mile, and has a sand-bank a little inside the extreme end; the sand-bank must not be depended upon as marking the extreme of the reef, as all sand-banks on coral reef, not vegetated, are liable to shift. There is deep water 200 yards from the rocks on the east, south, and south-west sides, and a clear deep passage between it and Esk island.

PANDORA REEF, 5 miles S.W. by W. from Dido rock, is covered at high water; at low water it dries one-third of a mile North and South, and the reef extends three-quarters of a mile North and South of the centre of the dry part. There is a clear deep channel between it and the Palm islands, but the reef has not been closely sounded.

Reef.—About $4\frac{1}{2}$ miles N.W. by W. $\frac{1}{2}$ W. from the north end of Pandora reef, and nearly 3 miles from the mainland, is the position assigned to a reef seen by the captain of the ship *Lady Elliot* in 1815.

HAVANNAH ISLAND is 3 miles South of Brisk island, with a clear deep channel between them; the island is about $1\frac{1}{2}$ miles long N.W. and S.E.; it has two peaks separated by a low gap; the south-east peak, 660 feet high, is sharp and well defined, the north-west one, 690 feet high, has a flat top and slopes to the north-west, from which a sandy point extends.

There is deep water within 100 yards of the east and south shores, but the west shore has a coral reef extending 300 yards from the shore, which dries at low water.

Fly Islet, one-third of a mile N.W. of Havannah island, is a rock covered with low brushwood, 95 feet high, and 200 yards in diameter; a coral reef extends one-quarter of a mile West, and is marked on the north end by a dry sand-bank which, however, is liable to shift; there is a narrow deep passage between Havannah and Fly islets.

CURACOA ISLAND, one-third of a mile N.W. of Calliope point, Great Palm island, is $2\frac{1}{2}$ miles long and a mile broad, it has a high level-topped grassy hill at the north end, 1,020 feet high; a sandy spit extends off the north-west extreme of the high land. The east shore is very steep and cliffy, with deep water within 50 yards of the rocks; the south-east and west shores have a coral reef skirting the beach, but it is only 100 yards broad, except close to the sand-spit on the north-west side, which must be cleared at 200 yards distance.

Calliope Channel, between Calliope point and Curaçoa island, is not recommended, but by keeping within one-quarter of a mile of Curaçoa island, and well clear of the detached reefs south of Calliope point, it may be safely used; to enter, steer S.W. past Calliope point until the gap

of Havannah island touches the summit of Eclipse island, when haul up S. by W., and then South. There is a strong tide in the passage, and the winds are baffling.

Curaçoa Channel, between Curaçoa and Fantome islands, is the clearest channel through the group, having no dangers; it is three-quarters of a mile broad off the Curaçoa sand-spit. The tides are strong and the winds very baffling.

FANTOME ISLAND, three-quarters of a mile to the westward of Curaçoa island, is $3\frac{1}{2}$ miles long, North and South; it has two grassy wooded hills 780 and 725 feet high, with a low gap between; the north hill, which is the highest, descends to a low sandy plain on the north-west end of the island, communicating with a hillock on the extreme, which at a distance appears as a small detached island. The north shore is steep-to, but there is a coral reef 100 yards off the east and south-west shores, and for one-third of a mile off the bay on the west side, filling up the channel between it and Orpheus island.

Juno bay, between Fantome island and Harrier point of Orpheus island, has a good anchorage in 7 or 8 fathoms water, mud bottom.

ORPHEUS ISLAND, immediately northward of Fantome island, is 6 miles long North and South, and from half to one mile broad, having two large bays on the west side; it has three ranges of low hills, steep on the seaward side; the highest, at the north end, is 645 feet high.

Iris Point, the north point of Orpheus island, has deep water close to the rocks, but immediately East and S.E. of it a reef extends 200 yards from the land; with this exception any part of the east coast may be approached within 200 yards.

Pioneer and Hazard bays, South of Iris point, have coral at the bottom; there is good anchorage in 7 fathoms water, the water suddenly shoals from 14 fathoms to 8 or 9.

Harrier Point, the south point of Orpheus island, has deep water close in, but East of the point the reef bends round to join Fantome island.

PELORUS or NORTH PALM ISLAND, lies half a mile North of Orpheus island; the channel between them is one-third of a mile broad, and by keeping mid-channel is clear and safe, but there is a strong current usually running the opposite way to the tide outside. The island is $1\frac{1}{2}$ miles long North and South, and has a thickly-wooded hill 985 feet high. There is deep water close to the rocks all round, except on the south shore, off which a reef extends for 100 yards.

Doubtful Shoals.—E. by N. 6 miles from Pelorus island, is the supposed position of the Zebra shoal, said to have been seen in 1836 ; and 6 miles to the eastward of the latter, is the doubtful position of a reef on which the *San Antonio* struck in 1821 ; there is also another doubtful shoal, said to exist E. $\frac{1}{2}$ N. 5 miles from the south end of Pelorus island. Neither of these shoals could be discovered when searched for by Lieutenant C. B. Yule in 1848, and by Commander G. S. Nares, H.M.S. *Salamander*, in 1867 ; nor is the position known of the doubtful danger said to bear about N.E. by E. 10 miles from the south-east point of Great Palm island ; also carefully looked for by Commander G. S. Nares in 1867.

The discoloured water, which is very prevalent in this part of the Inner route, has been, it is believed, frequently mistaken for reefs ; but due caution should be exercised when approaching these doubtful dangers.

ROCKINGHAM CHANNEL, immediately to the northward of Halifax bay, and the entrance of which is about $8\frac{1}{2}$ miles W. $\frac{1}{4}$ N. from the north extreme of Pelorus island, separates Hinchinbrook island from the mainland, and extends from its south-east entrance, about 28 miles north-westward to its opening into Rockingham bay, and is from one to 3 miles broad. There is deep water within ; but a bar, with generally heavy rollers breaking upon it, extends across a great portion of the entrance, leaving, however, a channel which is used by small steamers and sailing vessels making for Herbert river or port Hinchinbrook.

The western shore of Rockingham channel consists of mangrove swamps, cut up by winding creeks, and backed by a range of high rocky hills extending to the north-westward.

The south shore of the channel consists of a low well-wooded plain continuing back to the main range, which extends to the north-west from Cleveland bay ; the south point of the channel is $6\frac{1}{2}$ miles S. $\frac{1}{2}$ W. from Hillock point, Hinchinbrook island. Two of the mouths of the Herbert river are $1\frac{1}{2}$ miles and 5 miles farther to the south ; a bar was observed across the mouth of the south one, but there appears to be a narrow channel into the north one ; they have not been examined.*

Mount Leach or Westminster Abbey, 3 miles from the south end of the range of hills west and south-west of Rockingham channel, is a remarkable table hill about 2,750 feet high. This range rises abruptly from the low plain, 13 miles W. by S. $\frac{1}{2}$ S. from the south point of the channel entrance.

Bishop Peak, a sharp well-defined peak, 3 miles North of Westminster abbey, is about 2,760 feet high, and forms a part of the same

* See Admiralty chart:—Rockingham bay to Palm islands, including port Hinchinbrook ; No. 1,948 ; scale, $m = 0.5$ inch.

range. The range which continues to the north-west is probably higher, but it has not been examined.

Table Hill, 11 miles W. $\frac{1}{2}$ S. from Westminster abbey, is similar to it in appearance, and rises abruptly out of the plain, leaving a valley 5 miles broad between the two ranges, through which the Herbert river probably runs; it is the north extreme of the Cleveland bay range; the hills for 10 miles South have remarkable level summits; high land was seen through the gap to the north-west, but it is uncertain to which range it belongs.

Cordelia Hill from 600 to 800 feet high, appears as an island rising from the plain, 6 miles to the west of the southern mouth of the Herbert river; it is a conspicuous mark from the offing.

TIDES.—The tides set in at both ends of the Rockingham channel and meet between Haycock island and a peak on Hinchinbrook island, about 3 miles to the north of Haycock. Except after strong south-easterly winds, or when the Herbert river is flooded, there is a constant stream from its mouth setting northwards. Rise and fall, from 6 to 12 feet. High water, full and change, 9h. 30m.

DIRECTIONS.—A fairway buoy painted red, and carrying a flag, is placed on the outer edge of the bar extending from the southern entrance to the channel, in 9 feet at low-water springs. The bearings from it are as follows, viz., North extreme of Pelorus (North Palm) island E. $\frac{1}{2}$ S., Hillock point N.N.W., and Cordelia Hill S.W. $\frac{1}{2}$ W.

Having made the Fairway buoy, pass close to the northward of it, and steer W. by S. $\frac{3}{4}$ S. for a white beacon on the shore at the south side of the entrance, until you are abreast of a black buoy; then keep away a little to the westward, and when a red buoy is passed on the starboard hand, keep away and steer for a white beacon on the bluff at the south end of Hinchinbrook island, until within one quarter of a mile of the shore; then keep the island side of the passage as far as Haycock island, which is also to be left on the starboard hand. The banks lying off the mouth of the Herbert river, and which extend nearly two-thirds of the width across the channel, are marked by black beacons, which must be left on the port hand. From Haycock island steer in mid-channel as far as a small mangrove island, and pass it at a distance of half a mile on the starboard hand, then keep a mid-channel course to port Hinchinbrook, the channel being well defined and having from 5 to 8 fathoms water, the island shore being for the most part bold to approach and rocky; while from the mainland the shoal water extends a considerable distance, the bottom being mud and sand. By following these directions a vessel should not have a depth of less than 2 fathoms in the channel inside the bar at low-water springs.

When working out of the channel with easterly winds a vessel may stand towards the spit on the south side into 2 fathoms, at low water, but due allowance must be made for the tides which set over the bank.

Should the Fairway buoy be absent from any cause, the place for crossing the bar may be picked up by bringing the right extreme of the point of the mainland on the south side of the channel on with a remarkable high peak on the distant inland range. During south-easterly winds the bar at the south end of the channel is sheltered from the south-easterly swell by the Palm islands. When it is blowing fresh from the north-eastward, a heavy surf breaks upon the bar.

The HERBERT RIVER enters the Rockingham channel by several mouths, the eastern or Enterprise channel, about 5 miles from the entrance of Rockingham channel, is the one generally used; but the river is only navigable for about 5 miles by very small vessels, the navigation being much impeded by snags.

Dungeness is the name of the landing-place, situated about half a mile from the entrance to the channel, which is easily distinguished by the buildings on its right bank.

Buoys.—The entrance of Enterprise channel is marked by a black buoy, which is laid in $2\frac{1}{2}$ fathoms at low water, and is about half way between the white beacons on the south shore and the bluff or south end of Hinchinbrook island. From the black buoy to the landing, the channel—which is liable to shift, and is dry at low water—is marked by one red and two black beacons.

HINCHINBROOK ISLAND is 20 miles long, in a S.E. $\frac{1}{2}$ E. and N.W. $\frac{1}{2}$ W. direction, and from 5 to 9 miles broad; it is very rugged and mountainous; the tops and sides of the hills are bare, with numerous small waterfalls, which are generally running; the valleys are thickly wooded, and appear to have luxuriant vegetation; the southern shore is tolerably bold, rising to the lofty hills which extend across the south part of the island; but the greater portion of the western shore is low and fringed by a belt of mangroves. This part of the island has not yet been thoroughly examined.

Water.—There are many fresh-water streams on the east coast, but that coast being the most exposed to the prevailing south-east wind, it is doubtful whether a vessel could water conveniently; the largest stream is in Zoe bay, but the least exposed one is in the south part of Ramsay bay, $1\frac{1}{4}$ miles westward of Agnes island.

Mount Bowen, 3,650 feet high, is $8\frac{1}{2}$ miles from the south point, and 10 miles from cape Richards, and is the highest peak in the principal range, which extends $6\frac{1}{2}$ miles to the S.S.E. The Thumb, half a mile E.S.E. of mount Bowen summit, is a pointed rock 300 feet high, standing

by itself on the brow of mount Bowen, and showing as a very conspicuous mark from the southward, but from the eastward it is not so distinctly seen.

Nina peak is the most remarkable of the three well-defined peaks on the spur north of mount Bowen ; it is a rocky-topped peak one mile South of the end of the range, standing about 400 feet above the surrounding land, and about 800 from high-water mark.

Mount Diamantine, $4\frac{1}{2}$ miles S.S.E. of mount Bowen, is a smooth round-topped hill, 3,160 feet high, with a large boulder near the summit, showing conspicuously from seaward.

Mount Stralock is the southernmost high peak of this range ; it is 2,990 feet high and separated from mount Diamantine by a gap 1,650 feet high ; and not being quite so high, the top is more frequently clear of clouds, and is therefore valuable as a mark from seaward. The hills west of mount Stralock slope gradually down to the westward towards Rockingham channel ; the peaks are correctly fixed, but the land at the foot of them has not been examined.

Mount Pitt.—About $2\frac{1}{2}$ miles West of mount Bowen the high land terminates abruptly in a low plain, and rising again forms another range of hills, which extends 9 miles in a W.N.W. direction to Hecate point. Mount Pitt, 2,355 feet high, the highest peak of this range, is $2\frac{1}{2}$ miles from the north-west end, and $9\frac{1}{2}$ miles from mount Bowen, and shows as a well-defined peak.

Mount Burnett, half way between mount Bowen and mount Pitt is 2,210 feet high ; it is separated from mount Pitt by a gap 1,100 feet high ; the peak is not well defined, but Barra castle, one mile to the north-west, and 1,975 feet high, shows very prominently as a square-topped hill, and cannot be mistaken for any other part of the range.

Hillock Point, $10\frac{1}{2}$ miles N.W. $\frac{1}{2}$ W. from Pelorus island (the northernmost Palm island), is a perpendicular cliff 270 feet high, and 300 yards in diameter, connected with the mainland by a narrow sand-bank ; it is the east extreme of Hinchinbrook island, and has deep water alongside the rocks.

George Point is a low sandy point, thickly wooded, extending from $2\frac{1}{2}$ miles S.W. by S. of Hillock point for $3\frac{1}{2}$ miles in a S.S.E. and S.W. by W. direction, it forms the north side of the entrance into Rockingham channel : a bar, with very shoal, water, extends 2 miles to the south-east of it, nearly closing up the passage into the channel ; the water shoals gradually up to the bar from seaward.

Between Hillock point and the north extreme of the sand of George point the high land comes down close to the shore, and rocks extend out 200 yards, but all the dangers are above water.

Zoe Bay, $2\frac{1}{2}$ miles N.W. of Hillock point, is a sandy bay open to the south-east, having an entrance one mile broad; the water shoals gradually in to the beach; the coast North and South of the bay may be approached within one-quarter of a mile with a depth of 4 fathoms.

Agnes island, 4 miles N.W. by N. $\frac{1}{2}$ N. of Hillock point and 2 miles North of Zoe bay, is a rocky islet one-quarter of a mile in diameter, one-quarter of a mile from the land, and joined to it by a reef, which dries at low water; it forms the south point of Ramsay bay.

Ramsay Bay lies between Agnes island and cape Sandwich. From Agnes island the coast extends N.W. by W. 4 miles, being broken into several sandy bays, in most of which there are fresh-water streams, but the easiest to obtain water from is $1\frac{1}{4}$ miles West of Agnes island. As the land is approached the water shoals gradually with no hidden dangers.

Between this and cape Sandwich is a sandy beach $4\frac{1}{2}$ miles long, backed by sand-hills about 40 feet high at the north end, but one mile from the south end they terminate abruptly, leaving a very low sand-ridge; the water shoals gradually to within half a mile of the shore, with 4 and 5 fathoms; immediately off the south part of the beach a coral reef extends out nearly half a mile, being marked by a rock, awash at high water; with this exception the bay is apparently clear of dangers.

Anchorage.—Coasters might find shelter under Agnes island from the south-easterly winds by anchoring close to the island. A reef runs off 100 yards from the point half a mile to leeward of the island, but the rest of the coast may be approached by using the lead.

CAPE SANDWICH, N.N.W. 12 miles from Hillock point, is the north-east extreme of Hinchinbrook island; the high land extends 3 miles to the W.S.W. from the cape, and shows as two wedge-shaped hills sloping down to the eastward with a low gap between them, the westernmost one is 1,050, and the east peak 650 feet high; a reef runs off 300 yards from the south point of the cape.

Eva Islet, 115 feet high, $1\frac{1}{4}$ miles East of the cape, is thickly wooded and has a coral reef surrounding it, extending 100 yards to the eastward and 300 yards to the westward.

Channel rocks, between cape Sandwich and Eva islet, are about 15 feet high, and the reef surrounding them is 200 yards in diameter; there is a clear passage on each side with very deep water; that to the westward between them and cape Sandwich, is half a mile wide. The tide runs strong through this passage, and sailing vessels should not attempt it except in extreme cases.

CAPE RICHARDS, the north point of Hinchinbrook island, 5 miles W.N.W. from cape Sandwich, is 550 feet high and one mile long

North and South, and connected with the main body of the island by a low sand-neck; there are rocks below water on the north and east side, extending 100 yards from the shore; otherwise there are no dangers, and the north point has deep water 200 yards from the rocks.

Shepherd Bay, between capes Richards and Sandwich, is shallow; it has not been closely sounded, but there are no apparent dangers, and it may be safely entered with the lead going.

Kirkville hills, 515 feet high, are between the high land of capes Richards and Sandwich, and to which they are connected by very low sand-hills.

ROCKINGHAM BAY, situated between cape Sandwich and Dunk island, a distance of $17\frac{1}{4}$ miles N.N.W. $\frac{3}{4}$ W., and 14 miles in depth. The bay is easily distinguished by the heights of Hinchinbrook island, and the numerous elevated islets lying near its entrance; it is also easy of access, as there are no hidden dangers, and the soundings are regular, from 9 fathoms at the entrance, to $3\frac{1}{2}$ in the depth of the bay immediately westward of Goold island; the bottom is sand and mud. The bay is open to the eastward, but shelter from that quarter may be obtained on the north-west side of Goold island in $3\frac{1}{2}$ to 5 fathoms, or vessels drawing not more than 15 or 16 feet water may run into port Hinchinbrook.*

Brooke Islands.—These are a chain of small islets and rocks, off the entrance of Rockingham bay, connected with each other by a coral reef, which uncovers at low water, and extends S.E. and N.W. $2\frac{1}{2}$ miles; the reef may be approached within half a mile in all directions, except on the west side, where some foul ground extends about one-third of a mile from its edge. The north-westernmost and largest island rises to a peak 210 feet high, bearing N. by W $\frac{1}{2}$ W. $5\frac{3}{4}$ miles from cape Sandwich, and is a good mark for entering Rockingham bay from the southward, as there is a broad and deep channel on either side of the islands.

KENNEDY SHOAL is a dangerous coral patch, with its centre bearing N.E. by E. $\frac{1}{2}$ E. $9\frac{1}{2}$ miles from the north-westernmost Brooke island. The shoal is about $1\frac{1}{2}$ miles in circumference, and the least depth of water found on it was 2 fathoms. It is only $4\frac{1}{2}$ miles from the inner edge of the Barrier reefs.

Goold Island, situated in the southern part of Rockingham bay, is about 6 miles in circumference, thickly wooded, and rises in the centre to a peak 1,375 feet high. Close off the east point, are two rocks above water; a shoal, on which are a small islet and some rocks, extends off the

* The soundings between Goold island and the mainland were represented by Commander Robinson H.M.S. *Pioneer*, in 1862, to be 2 or 3 feet less than shown on the chart.

low south-west point of the island ; and at half a mile to the north-westward of the point is a covered rock. The north-east coast of Goold island is steep and rocky, and may be approached to the distance of half a mile, in from 5 to 6 fathoms water. The west coast is lower, and affords convenient landing-places.

The south-west part of the island is connected with Hinchinbrook island by shoals, extending from the north point to Hecate point, the north-west extreme of the latter island. A deep indentation of the eastern edge of these shoals, between Goold island and cape Richards, affords a space of 6 square miles, in which secure anchorage, in from 3 to 7 fathoms, sand, may be found, sheltered from south-easterly gales.

Water.—At about one-third of a mile to the south-westward of Fly point, on the west side of the island, a small stream of excellent water runs over the rocks into the sea, which at different seasons of the year, always affords a good supply : wood for fuel may also be procured in abundance, close to the shore. Vessels passing through the Inner route, being short of these necessities, would find Goold island a convenient place for procuring them.

CURRENT.—Northward of Brooke islands a current sets to the northward with varying strength, dependent on that of the S.E. trade wind.

Southward of the islands the tides are regular, the flood setting to the southward.

PORT HINCHINBROOK is situated between the north-west extreme of Hinchinbrook island and the mainland ; it extends from Hecate point about 4 miles in a south-easterly direction and is about $1\frac{1}{2}$ miles wide, but the anchorage, in which from 4 to 10 fathoms will be found, is contracted to about a mile in breadth by the shoal water which extends nearly half a mile from both shores, excepting off Hecate point where it is bold-to. Inside 4 fathoms the water shoals very quickly.

The harbour is sheltered from all winds, but those from the northward, from which quarter, however, it seldom blows hard and raises but little sea.

Vessels drawing more than 16 feet should not attempt to enter port Hinchinbrook at low water, as at that time of tide there is only about 18 feet on the great flat extending from the west side of Goold island to the main. The entrance channel, although deepening as the port is approached, narrows considerably, being only three-quarters of a mile wide $2\frac{1}{2}$ miles North of Hecate point ; from here it widens again, deepening gradually to the port.

CARDWELL.—This town, built close down to the beach on the mainland opposite Hecate point, was founded in 1863, but is now a thriving place, being with its capital harbour the outlet of the produce of a large

tract of mineral and pastoral country. It possesses a court house, custom house, and is the northern station in Queensland reached by the telegraph wire. A wooden jetty, 1,000 feet long, extends from the beach abreast the town. The population in 1875 amounted to 331.

Trade.—The value of the exports and imports in 1872 amounted to 55,726*l*.

DIRECTIONS for Port Hinchinbrook.—In entering Rockingham bay from the southward, pass about half a mile outside Eva islet, and when well clear of it steer in for Goold island. If drawing more than 7 or 8 feet water, strangers had better pass to the northward of Goold island, which they may approach to a distance of half a mile; when to the northward of Hayman point—the N.W. point of the island—steer W.S.W., making due allowance for tides, until Hecate point bears S. $\frac{1}{4}$ W., when steer for the centre of the entrance of port Hinchinbrook, passing half a mile to the westward of the point, and anchor according to draught of water off the town. When within the 3-fathoms line the water shoals gradually in-shore, the bottom being soft mud.

Vessels drawing not more than 7 or 8 feet, when past Eva islet, may haul up, and pass at a distance of half a mile from cape Richards, thence pass about one third of a mile south of a small rock about 30 feet in height, lying South of Goold island. From this position steer about W. $\frac{1}{2}$ S., until the south extreme of the large Brooke island is on with the south point of Goold island. Keep these marks on until Hecate point bears South, when alter course for the port and anchor as above; or, when near high water, haul alongside Cardwell jetty, or ground on the mud close to the sandy beach fronting the shore. The mud extends to within 60 yards of the trees at the edge of the beach.

Directions for small vessels approaching port Hinchinbrook through Rockingham channel, have been given on page 223.

Caution.—Cape Sandwich, Kirkville hills, and cape Richards, being joined to Hinchinbrook island by low sand-necks, forming Ramsay and Shepherd bays, show as islands from the offing or in the thick hazy weather which usually accompanies the S.E. trade wind: this low land might possibly be mistaken for the passage between Goold and Brooke islands, great care is therefore required in vessels running in for Rockingham bay, not to mistake cape Sandwich and Eva islet for the Brooke islands; Eva islet and the S.E. Brooke are alike in size and appearance, but the highest, Brooke island (the N.W. one), is 210 feet high, and only half a mile long, whereas cape Sandwich would show two hills 650 and 1,050 feet high, and 3 miles long.

Western Shore of Rockingham Bay.—From the town of Cardwell the shore trends N. by W. 7 miles, and then N.N.E. $10\frac{1}{2}$ miles to

Tam O'Shanter point, which lies about N.N.W. $\frac{1}{2}$ W. $11\frac{1}{2}$ miles from Goold island peak. This shore is the margin of an extensive tract of low, flat, sandy, and alluvial land, bearing a fair proportion of forest trees; it is intersected by numerous creeks, in most of which fresh water is found.

Mackay River, about 4 miles to the south-westward of Tam O'Shanter point, is the largest of them. This river was ascended in August 1863 by the boats of H.M.S. *Hecate*, and at 3 miles from the mouth found to be a rapid stream; 3 miles beyond, where the river was 60 or 70 yards broad, it was obstructed by snags, &c. The banks were generally swampy and covered with palm trees and large creepers. Most of these creeks are inaccessible at low tide, even for boats, their mouths being barred by a mud-flat, which skirts this side of the bay, the outer, or 3-fathoms edge, being from one to 3 miles from the shore, and extending farthest off abreast of Goold isle.

TAM O'SHANTER POINT is a cliffy projection, covered with grass and a few stunted trees; on the west side of it is Kennedy bay. At 2 miles south-westward of the point is a grassy bluff, which is the eastern side of the entrance to Hull river, that runs to the northward and north-westward for 7 or 8 miles; the western shores of this river are principally covered with mangroves.*

FAMILY ISLANDS, which stretch across the northern part of Rockingham bay, are a group of seven small rocky islands of moderate height, extending in a south-east direction from 2 miles eastward of Tam O'Shanter point to N. by E. 7 miles from Goold island peak. The north-westernmost of the group is a small peaked islet, with some rocks above water close to the northward of it, enclosed by a reef, connecting them with the western part of Dunk island.

The largest of the Family isles, E.S.E. $2\frac{3}{4}$ miles from Tam O'Shanter point, is about $1\frac{1}{2}$ miles in circumference; rocks above water extend along its north-west side, and off its south-east point; the island is enclosed by a reef projecting nearly a mile to the southward of it. There is a clear 5-fathoms channel, half a mile wide, between this and the peaked islet to the north-westward of it.

The other five islets of the group are similar to each other in size and aspect, with deep channels between all but the three south-easternmost, which are closely clustered together, with sunken rocks between them; but they may be approached to half a mile on all sides, in from 8 to 11 fathoms water.

* It was here the late Mr. Kennedy and his party first landed, to commence their ill-fated exploring expedition to the northward, in 1848.

These islands are partially covered with stunted trees, and like Brooke islands, are good marks for entering Rockingham bay; but none of them afford sheltered anchorage under their lee.

DUNK ISLAND, which bounds Rockingham bay to the northward, is $3\frac{1}{2}$ miles long S.E. and N.W., and from half to one mile broad; the southern of the two peaks to which the island rises, is 860 feet high; its coast is steep and rocky, except on the south-west side, where it is low, with two sand-spits running out, the southern of which terminates at a small islet. A high rock lies close off the south-east point of the island, with deep water outside it.

A shoal, with from one to 3 fathoms water on it, extends from three-quarters of a mile off the north-west end of Dunk island, to the north-westernmost of the Family isles.

Dunk island was inhabited in 1848 when H.M. Ships *Rattlesnake* and *Bramble* visited it.

The channel between the shoal off the western side of Dunk island and the mainland is about one mile broad; but a $3\frac{1}{2}$ -fathoms patch lies three-quarters of a mile to the eastward, and another with $3\frac{1}{2}$ fathoms water on it, S.E. by S. $1\frac{1}{2}$ miles from Tam O'Shanter point.

Water.—A good stream of water runs into the sea at the north-west end of a sandy beach, near the west point of Dunk island, at about a mile to the southward of the anchorage. At high water, boats may land close to the watering-place; but at low water, it is necessary to roll the casks some distance, in consequence of the mud-flats extending from the beach. Abundance of wood may also be procured on the island, as it is thickly wooded to its summit, many of the trees attaining a great size.

TIDES.—It is high water, full and change, at Dunk island at 9h. 28m.; springs rise from 6 to 10 feet.

Mound islet, half a mile westward of the north-west extreme of Dunk island, is a small islet fringed by a coral reef, and was Captain Owen Stanley's first starting point for the survey of the Inner route to the northward.

Anchorage.—There is anchorage in from 5 to 8 fathoms, with excellent holding ground, off the north-west end of Mound islet, at about a mile from the shore, sheltered from the prevailing south-easterly winds.

DIRECTIONS.—In going through the channel between Dunk island and the mainland, from the southward, a vessel should border on the latter after having passed the spit which extends one mile from the shore $1\frac{1}{2}$ miles northward of Tam O'Shanter point, and not alter course to the eastward until the north-western point of Dunk island bears E. by N.

Clump Point, N. $\frac{1}{4}$ E. $7\frac{1}{2}$ miles from Tam O'Shanter point, is low and rocky, and is the extreme of a narrow piece of land projecting about

one mile to the north-east from the general run of the coast. There is a shoal patch, with some rocks, half a mile to the southward of it, they are bold-to but may be avoided by not approaching within one mile of the point. Part of a wreck was seen on the north side of the point in 1848, and the natives were numerous.

The COAST.—From Tam O'Shanter point to Clump point the coast is nearly a straight sandy beach, fronting a well-wooded range of moderately high hills, at about a mile inland.

The coast between Clump and Double points chiefly consists of sandy beaches, with a low country extending a considerable distance inland. There are several hills near the shore ; Clump mount, which is 1,338 feet high, bearing West 2 miles, Double hill, W.N.W. $3\frac{1}{4}$ miles, and Bay hill, N.N.W. $5\frac{1}{4}$ miles from Clump point. At 5 miles to the northward of Bay hill is Brown range, with a small creek close to the southward of it. West 9 miles from Clump mount is a high range of mountains, the highest point of which attains the elevation of 3,965 feet.

From Clump point to 3 miles northward of it, the shore may be approached to a mile in 5 fathoms water ; a flat bank, with as little as 3 feet water on it, then extends 3 miles from the land, to the eastward of Bay hill, and nearly joins King reefs.

DOUBLE POINT is an isolated hill of moderate elevation, bearing North 12 miles from Clump point.

King Reefs lie N.N.E. 5 miles from Clump point, and are barely covered at high water, but they are bold to approach outside.

NORTH and SOUTH BARNARD ISLETS, six in number, are small and rocky, and are about $3\frac{1}{4}$ miles from the shore. The two South Barnard islets, which lie close together, at about $1\frac{1}{4}$ miles to the northward of King reefs, are surrounded by a reef, dry at low water, and only partially covered at high water ; the northern of these two islets is about half a mile long, East and West, and is steep and rocky, but well wooded, some of the trees being of large size. The other islet is little more than a rock, with a few trees upon it. The reef inclosing these islets is, like King reefs, nearly connected with the flat bank, above noticed, the outer edge of which here recedes north-westward, toward Brown range.

The North Barnard islets extend from half a mile to $2\frac{1}{4}$ miles to the south-eastward of Double point. The outer islet of the cluster is about three-quarters of a mile in circumference, with tall trees growing on it, amongst which are a few banana trees ; a small patch of dead coral on its western end, affords a convenient landing-place. A small rock, steep-to, and always above water, lies 3 cables off the east point of the islet ; but there is a 4-fathoms patch at about one-third of a mile to the northward of it.

The next two islets of the cluster, lie close to the north-westward of and are similar in aspect to that just described; but they are not so large. A small rock lies half a mile to the north-westward of the western islet. There is also a sunken rock with 6 feet on it at low water, midway between the latter small rock and the northern Barnard island close off Double point. The northernmost of the Barnard group, which is lower than the others, lies barely half a mile off Double point, with which it is connected by shoal water.

The space between the two southernmost, and the northern cluster of the Barnard islets, forms a clear bay with deep water close to the land.

The natives occasionally visit Barnard islets to obtain fish and turtle; but as no water was found on them, it is not probable that they are permanently inhabited.

Anchorage is to be obtained in 8 fathoms water, sheltered from the prevailing south-east winds, north-westward of the outer islet of the North Barnard group.

The COAST.—A steep coast range of moderate height rises immediately to the northward of Double point, and continues to Cooper point, except near Gladly river, where the low land extends a considerable distance into the interior.*

The coast reef between Mourilyan harbour and Gladly inlet extends from $1\frac{1}{2}$ miles to half a mile off shore, but from $1\frac{1}{2}$ miles north-westward of the latter as far as $6\frac{1}{2}$ miles northward of Cooper point the shore should not be approached nearer than 2 or $2\frac{1}{2}$ miles, as shoal water extends some distance off; the eastern edge of which is so steep-to, that the lead gives but little warning.

To the northward of Cooper point, the land is low near the sea, but backed by a succession of hills, the highest of which, bearing N.W. $\frac{1}{4}$ N. 9 miles from the point, is 2,166 feet high.

MOURILYAN HARBOUR.—From Double point the coast, which is moderately high, trends N.N.W. 3 miles to Hayter point, close off which is an islet; the shore between should not be approached within three-quarters of a mile as shoal water extends some distance off. Mourilyan harbour is a little more than one mile N.W. by W. from Hayter point the shore being bold-to; the entrance to the harbour is 3 cables wide from the high land on either side, but this is contracted to only 300 yards by the rocks extending to the southward from the north point, the southern and largest is named Goodman.

The passage into the harbour is southward of the Goodman and the

* See Admiralty chart of the east coast of Australia, sheet XVI. Double point to cape Tribulation, and the Barrier reefs, No. 2,350; scale, $\pi = 0.25$ of an inch. Also, plan of Mourilyan harbour on same chart.

least depth of water in the centre of the channel—which is barely 200 yards wide—is 28 feet. The entrance being so narrow, it should not be attempted by sailing vessels, except with a fair and commanding breeze.

After passing the entrance the channel gradually widens and deepens to 7, 8, 10, and 12 fathoms, and at Camp point, half a mile from the entrance, on the south shore the harbour opens out; it is $3\frac{1}{2}$ miles long N. by W. and S. by E., and from $1\frac{1}{4}$ to $1\frac{3}{4}$ miles wide.

A depth of from 4 to 12 fathoms is found on the north side of the harbour facing the entrance, but these depths are restricted to only a small space extending about three-quarters of a mile westward of Camp point, and from 3 to 4 cables broad. The western part of the northern boundary of the deep water is about half a mile from the north shore which forms one great bay filled up with very shoal water. On the western side of the harbour are Walter and Armit creeks.

Small vessels may obtain anchorage southward of Camp point and close to the shore in from 2 to 3 fathoms water, but the remaining part of the harbour is apparently a mud-flat with from 3 to 6 feet water on it at low tides.

Moresby River empties itself in the southern end of Mourilyan harbour and has several islets at the entrance; a narrow channel, in which not less than 9 feet at low tide was found, leads from Camp point to the entrance of the river, having for the first mile a depth only of 6 feet at low tide; above that point for a distance of about 14 miles there was not less than 8 feet water in the stream. The current is sluggish, and the banks are clothed with mangrove bushes.

TIDES.—The tides in Mourilyan harbour apparently range from 8 to 12 feet.

Gladly Inlet or Johnstone River, 5 miles northward of Mourilyan harbour, has a bar with 4 to 6 feet on it at low water. Inside, the stream is about 150 yards in width, and it deepens to 3 fathoms for 2 or 3 miles, it then shoals to 6 feet for upwards of a mile when the river divides into two branches; the southern branch after running to the southward for several miles bends to the westward, it appears to be very shallow; the northern branch also turns westward after running a short distance to the northward, this is the main stream and carries a depth of from 3 to 5 fathoms, and found to be navigable for small craft for 10 miles, it then quickly shallows. About 10 miles from the entrance the river is fresh at high water. The banks are of rich alluvial soil, and clothed with a dense scrub.

Cooper Point, N.N.W. $16\frac{1}{2}$ miles from Double point, is 340 feet high and round in shape; but when seen from the northward or southward appears peaked; some rocks lie near the shore at $1\frac{1}{2}$ miles to the southward.

Mulgrave and Russell Rivers.—At 10 miles N.W. $\frac{3}{4}$ N. of Cooper point is Bramston point, and $1\frac{1}{2}$ miles beyond Constantine point, the south side of the entrance to the Mulgrave and Russell rivers, which severally branch to the north-west and south-west $1\frac{1}{2}$ miles from the point.

A sand-bank, on which the water breaks, extends $1\frac{1}{2}$ miles north-eastward from Constantine point, leaving a narrow passage with 6 feet in it into the river. Inside, there are from 3 to 6 fathoms to where the rivers divide; they quickly become shallow, having only 5 or 6 feet water for a few miles up. The land between the two rivers extending back to the Bellenden Ker range, is composed of rich soil covered with dense jungle.

FRANKLAND ISLANDS, which lie off the entrance of the Mulgrave and Russell rivers, are small and known as I., II., and High island.

I. Island, N. $\frac{1}{4}$ E. 10 miles from Cooper point, and $6\frac{1}{2}$ miles from the mainland, is low to the northward, but rises southward to about 80 or 90 feet in height, and is wooded to its summit: a coral reef surrounds it, close to which the water is deep; but the island is too small to afford sheltered anchorage. Some cocoa-nut trees were seen growing on its south-east side, from which fruit was gathered in June, 1848.* A rock awash at high water, lies about South $1\frac{1}{2}$ cables from the island.

II. Island like I., from which it bears N.W. 2 miles, is also wooded at its north-west end, and rises to a hill about 30 feet high; on the south-east side it is low, and there is a coral reef, covered at high water, for about a mile towards I. island which terminates in a rocky mound similar to that on the north-west end. These two islands are nearly connected by a coral reef, partially dry at low water, and on which are three barren rocks.

The islands and the reef connecting them, are bold to approach, and there is good anchorage, in from 8 to 10 fathoms, at half a mile to the north-westward of II. island.

Firewood, and some tolerably good timber may be procured, the former in abundance, on II. island; but there was no indication of fresh water.

High Island, N.W. by W. $4\frac{1}{2}$ miles from II. island, is nearly one mile long N.E. and S.W., half a mile broad, and 400 feet in height. A rock, dry at high water, lies East $1\frac{1}{2}$ cables from the east point of the island; and on its north side is a sandy beach fringed by a coral reef, extending about two cables' lengths from the shore; in the centre of this beach a small quantity of fresh water was found. This island may be approached with safety, on all sides, at half a mile off; but the anchorage under its lee is not so good as that under II. island.

* It is remarkable that these are the only cocoa-nut trees recorded as growing on the east coast of Australia.

The passage between the Frankland islands and the mainland is clear, with an average depth of 10 fathoms ; but it is not more than $1\frac{1}{2}$ miles wide between High island and the shoal water which skirts the shore.

The COAST from Palmer point 2 miles S.W. by W. $\frac{1}{4}$ W. of High island forms a bay, extending $16\frac{1}{2}$ miles, in a N. $\frac{3}{4}$ W. direction, to the south-east extreme of cape Grafton ; it is about 4 miles in depth, but a vessel should not approach the land, in the southern part of the bays within $2\frac{1}{2}$ miles, as there is foul ground, steep-to, from one to 2 miles from the shore.

The shore of the bay consists of a succession of rocky points and sandy beaches, behind which a range of mountains extends close along shore to the back of cape Grafton ; the highest summit stands about 2 miles to the southward of the bight of the bay, and reaches an elevation of 3,357 feet. To the north-eastward of this range, on the peninsula of which cape Grafton is the extreme, the country is low, with four mountainous ridges, lying nearly parallel with each other, in a south-east and north-west direction ; the Murray Prior range or south-westernmost being 2,710, and the outer, or north-eastern ridge, which is cape Grafton, 1,273 feet above the level of the sea.

ASPECT.—The whole country from Clump point to cape Grafton, appears generally fertile and well wooded. The most elevated part is mount Bartle Frere, 5,438 feet high, bearing W. by S. 15 miles from Cooper point. Between this mountain and cape Grafton are the Bellenden Ker mountains, which attain an elevation of 5,158 feet ; they trend nearly parallel with the coast, from which they are distant 6 to 7 miles ; the intervening land is low and well wooded. The central and highest summit of this range bears N.W. by W. $\frac{1}{4}$ W. 15 miles from Cooper point ; and N.N.W. $\frac{1}{4}$ W. 8 miles from the same summit is Walsh Pyramid (Conical hill), which is 3,016 feet high.

This coast in June 1848 appeared to be thickly inhabited ; the natives seen were fine and well-made ; near Cooper point they came off on catamarans, although a canoe, with a single out-rigger, was seen near cape Grafton.

CAPE GRAFTON.—The land about cape Grafton may be recognised at a distance in clear weather when seen from the southward or northward, by its appearing like three lofty islands. The outermost eminence is Fitzroy island, but the others are lofty ridges upon the mainland separated by very low land only visible 4 or 5 miles off ; the north-easternmost of these ridges, 1,273 feet in height, forms the cape, and is rocky and sterile ; but it is conspicuous from having two small peaks close together, on the west extreme of its summit.

The north-east face of the cape is bold and cliffy, and may be safely approached within half a mile in deep water.

Caution.—A vessel coming from the N.W. in misty weather—which is very prevalent on the whole of the coast—is liable to mistake False cape, the point west of cape Grafton, for the real cape.

FITZROY ISLAND, $2\frac{1}{4}$ miles south-eastward of the south-east extreme of cape Grafton, is about $1\frac{3}{4}$ miles long N.E. and S.W., and two-thirds of a mile broad. It rises to a peak 860 feet above the level of the sea, and is well timbered, nearly to its summit. The coast of the island is steep and rocky except on its north-west side. A rock above water lies close off the north-east point, and shoal water extends about half a mile from the north-west extreme; with these exceptions there are no dangers about the island, and the water being deep, it may be passed within a mile on either side.

The channel between cape Grafton and the shoal off the north-west end of Fitzroy island is nearly 2 miles wide, with deep water; and although the streams sometimes run through with much strength, it is free from danger.

Water.—A good supply of fresh water may be procured at Fitzroy island with little trouble, at the back of a coral beach abreast of the anchorage. Wood is also abundant close to the shore.

Anchorage.—There is good anchorage in 10 and 12 fathoms, on the north-west side of Fitzroy island, at from one quarter to half a mile off the shore.

TIDES.—It is high water, full and change, at Fitzroy island at 9h. 15m.; springs rise 7 to 12 feet. The tidal streams run with great strength on both sides of the island.

CURRENT.—The current running to the northward towards Green island reef and the Trinity opening, is very dangerous and requires to be guarded against in misty weather or at night. Green island and the vegetated sand-bank north-west of it are good marks by day. *See page 258.**

TRINITY BAY is comprised between cape Grafton and cape Kimberley, a distance of 44 miles N.W. $\frac{1}{4}$ N., and from 7 to 9 miles deep throughout. Directly opposite the centre of the bay is the Trinity opening through the Barrier reefs. *See page 258.*

Immediately to the westward of cape Grafton, are two very shallow bays: the eastern bay being between capes Grafton and False, and the western between False cape and Casuarina point, at the bottom of which is Trinity harbour: in the eastern, is a small rocky islet, half a mile northward of which a small vessel may find anchorage, sheltered from S.E. winds, in about $2\frac{1}{2}$ fathoms water. Both bays are filled up with shallow

* Mr. T. H. Hayman, Master H.M.S. *Salamander*, March 1866, remarks: "We experienced a set to the north-west of about 4 miles per hour, while off Trinity bay and Fitzroy island."

water, a depth of 3 fathoms reaching out to a line W. $\frac{1}{4}$ N. from cape Grafton; there is also a spot of $3\frac{1}{2}$ fathoms with 6 fathoms close outside, $1\frac{1}{2}$ miles N.W. from the north-west extreme of the cape.

From Casuarina point a low, wooded coast, with rocky points and beaches, extends N.W. 10 miles to a bluff point, at one mile north-eastward of which is Double island.

From Double island a coast similar to that immediately to the south-eastward, continues N.W. $18\frac{1}{2}$ miles to Island point, a long red hillock, which being connected with the main, by low land, has at a distance, the appearance of an island.

About 8 miles north-westward of Double island, are some white cliffs, one mile to the south-eastward of which is a rock, nearly awash, three-quarters of a mile from the shore: the cliffs are red at about $2\frac{1}{2}$ miles to the southward of this rock.

Nearly $5\frac{1}{2}$ miles beyond the white cliffs above mentioned, the shore reef extends off the land in a northerly direction for some distance; the outer extreme of the spit being $3\frac{1}{2}$ miles from the shore and bearing S.E. by E. $\frac{1}{4}$ E. from the south extreme of Island point; it is very dangerous having deep water close-to. On this spot the A. St. N. Co. vessel *Alexandra* was stranded.

Between Island point, which is 755 feet high, and Snapper island, the coast forms a bay; but shoal water runs off nearly 2 miles from the southern part, and there are two coral patches in the bight. Immediately westward of Island point is Dickson inlet and port Douglas. About 4 miles N.W. by W. $\frac{1}{4}$ W. from Island point is the entrance of the Mossman river, or rather rivulet, which appears to continue for only 4 or 5 miles inland.

The depth of water in Trinity bay is regular, and the shore may be approached to about $1\frac{1}{2}$ miles, except in the southern and northern parts, where shoal water extends farther from the land, the most distant from the shore being the spit, before described as stretching out to the south-eastward of Island point.*

Many natives were seen along the shores of Trinity bay, between Double island and Island point.

CAIRNS (TRINITY) HARBOUR.—The entrance to the harbour is at the bottom of the bay formed between False cape and Casuarina point. The anchorage is sheltered from East round by south to West. There are three channels from the anchorage into the port. The east channel, the one in present use (1878) is the most direct, and carries

* A coral reef, with 6 feet water, and 7 fathoms close-to, on which the S.S. *Egmont* recently struck, lies with Low Island lighthouse bearing N. $\frac{1}{4}$ W., and Island point N.W. by W. $\frac{1}{4}$ W.

Also, a coral patch awash at low water springs, with 8 fathoms close-to, is reported to lie with Island point bearing W. by N. $\frac{1}{4}$ N., and Low Island lighthouse North a little easterly.

at least 6 inches more water than the other two. The shoalest water ($7\frac{1}{2}$ feet at low-water springs) is found from one to 2 miles inside the Fairway buoy. Inside the latter distance the water deepens gradually till there is over 30 feet just off the wharves; the river extends 5 or 6 miles to the southward, and has a depth of from 4 to 7 fathoms.

The township of Cairns is at the river mouth on the western shore, but the wharf at Smith's landing is $1\frac{1}{4}$ miles higher up.

A red Fairway buoy with a flag lies in 14 feet at low water, N.N.E. 4 miles from the outer light, with False cape bearing E. by S. $\frac{1}{4}$ S. 2 miles; thence the channel in is marked by red buoys and beacons on the starboard hand, and black buoys and beacons on the port hand.

TIDES.—It is high water, full and change, at Cairns at about 9h. 30m.; springs rise 8 to 10 feet, neaps range 8 to 4 feet. At neaps with northerly winds the rise at times hardly reaches 3 feet.

Water.—There are several wells near the shore about three-quarters of a mile northward of the western point of the entrance.

Double Island is three-quarters of a mile long, with a small rock, resembling a haycock, lying two-thirds of a mile to the south-eastward of it, the whole being surrounded by a coral reef.

Anchorage.—There is anchorage, in 5 fathoms, with good holding ground, on a muddy bottom, at half a mile from the north-west side of Double island, sheltered from south-easterly gales.

Port Douglas.—The anchorage in port Douglas roadstead, in about 19 feet water, at 2 cables off the north extreme of Island point, is protected from North round by west to S.S.E., east of which it is exposed. The holding ground is good, and in moderate weather there is no great difficulty in transshipping cargo. At low water the inlet has about one foot at the entrance, and is both narrow and shallow all the way to Walsh's wharf, which is on the eastern side, and runs off from the township of port Douglas. Above the wharf the inlet is reported as having deeper water for 4 or 5 miles.

Tides.—It is high water, full and change, at port Douglas at about 9h.; springs rise 9 to 12 feet, neaps range 2 to 4 feet.

DAINTREE RIVER.—The entrance of this river lies W. by S. $2\frac{1}{2}$ miles from cape Kimberley, it has a bar with at present 9 feet on it at low-water springs, about one mile outside the river. Inside the bar the passage runs between two spits, which partially dry, and extend about three-quarters of a mile in a S.S.E. direction from Hall and Wyanbeel points, forming the entrance; the channel gradually deepens into the river, where from $1\frac{1}{2}$ to 2 fathoms will be found for several miles up.

For the first 5 miles the shores are lined with mangroves; the land adjacent to the foot of the coast range appears to be composed of a sandy

soil, which is covered with dense scrub. Large quantities of cedar are obtained from this river.

The Tide rises from 6 to 9 feet.

DIRECTIONS.—There appear to be no hidden dangers in approaching the river, the water shoaling gradually towards the bar. On nearing the entrance, the channel over the bar will generally be visible, except when there is any fresh in the river. A clump of tea trees will be also observed on the south shore with two trees detached a short distance to the southward; keep these two trees on a N.W. westerly bearing until within a cable's length of the south shore, alter course to North a little easterly, and steer up the river, anchoring as convenient in $2\frac{1}{2}$ fathoms at low water.

Snapper Island, is $1\frac{1}{2}$ miles long N.W. and S.E., about half a mile broad, and N. $\frac{1}{4}$ E. 11 miles from Island point, and only separated from the high and bold cape Kimberley by a channel two-thirds of a mile wide, clear of danger. The island is covered with wood and long grass, on the north and west sides, but nearly bare on the other sides, some of the trees are of considerable size; it has three hills, the highest of which at the north-west end is 350 feet high. The water is deep all round the island; and there is anchorage under its lee, but it cannot however be recommended on account of the swell which rolls in.

ASPECT.—Behind the western of the two bays, immediately within cape Grafton, the mountain ranges, with a deep valley between them, through which runs Dickson river, trend to the southward, a considerable distance towards the Bellenden Ker mountains.

At 15 miles to the westward of cape Grafton, Red peak, 2,032 feet high, forms the south-east end of a steep range called Macalister range, running nearly parallel with the coast, mount Buchan, 2,086 feet high, approaches within a mile near Double island; the most elevated part, mount Formantine, 2,612 feet high, is $3\frac{1}{2}$ miles West of the island. The north part of this range is named Victory heights, terminating in mount Beaufort, 1,752 feet high.

Close behind the centre of this range is Harris peak, attaining an elevation of 3,573 feet, which seemed to be the eastern part of some more inland mountain chain: it was seen from Fitzroy island, and from a station at a considerable distance to the northward.

At the back of the low land, to the northward of Island point, are ranges of high mountains and hills thickly wooded.

LOW ISLES are, properly speaking, only two in number; the larger, N.E. $\frac{3}{4}$ N. 8 miles from Island point, is situated near the west end of a coral reef; and is a well-wooded, low, sandy islet, about 300 yards in circumference, with foul ground extending about half a mile to the

westward. The other islet is composed of one or two clumps of mangrove, growing near the eastern edge of the reef. The whole of this danger is about $1\frac{1}{2}$ miles long E.N.E. and W.S.W., and one mile broad at the eastern end : shoal water extends some distance off the south-east point.

Anchorage.—There is good anchorage in 7 or 8 fathoms, under the north-west side of Low isles, at half a mile from the shore; the bottom, which is mud, is good holding ground, and the water is smooth.

The channel is clear between Snapper and Low isles.

LIGHT.—A light is exhibited from a white lighthouse standing in the centre of the westernmost Low isle.

The light is a *revolving* white light, attaining its greatest brilliancy *every minute*, elevated 65 feet above the sea, and visible in clear weather 14 miles.

SATELLITE ROCK is a sunken coral reef with several rocks on it, having only 2 fathoms water over them; it extends three-quarters of a mile in a N.W. and S.E. direction, and from the general discoloured appearance of the water around is not easily distinguished from the mast-head. From the rock the western Low isle bears W. by N. $\frac{3}{4}$ N. $7\frac{1}{2}$ miles, and Round hill S.W. $\frac{1}{2}$ S.

The COAST.—Nearly $2\frac{1}{2}$ miles northward of cape Kimberley is a projecting headland composed of three bluff points; half a mile off the centre one is Black rock, high and nearly bold to. Close behind the headland is a hill 1,454 feet high.

From Black rock to cape Tribulation, the shore is bold, and may be approached to half a mile in $3\frac{1}{2}$ fathoms. The country mid-way, is low and thickly wooded, between the mountains and hills.

CAPE TRIBULATION, N. by W. $12\frac{1}{2}$ miles from Snapper island, is a bare hillock jutting out from a bold headland, 4 miles West of which is Peter Botte mountain, 3,311 feet high; the cape itself is only remarkable when seen from the northward or southward; a small detached rock lies a few yards off it, but the water is deep close outside.*

WEARY BAY, the southern point of which is 9 miles N.W. by N. from cape Tribulation, is not deep enough to afford shelter, even for a small vessel, in south-east winds, and the bottom is uneven and rocky for at least a mile from the beach.

Bloomfield rivulet flows into the south-west corner of Weary bay; the bar at its entrance is very shallow, and extends some distance from the shore. The rivulet was traced by Captain King, R.N., 4 or 5 miles inland, the depth of water inside being from 3 to 4 fathoms.

* See Admiralty chart of Australia, east coast, sheet XVII., cape Tribulation to cape Flattery and Barrier reefs, No. 2,351; scale, $m = 0.25$ of an inch.

At 2 miles to the northward of Bloomfield rivulet, a dangerous covered ledge of rocks projects one mile from the shore, and a reef is said to exist at about $1\frac{1}{2}$ miles to the north-eastward of the entrance of the rivulet; but it was not seen by the boats of the *Rattlesnake*.*

The Natives of Weary bay were very numerous, and not to be trusted.

ASPECT.—The land at the back of cape Tribulation rises abruptly to a considerable height, Peter Botte, a very remarkable peak, 4 miles to the westward of the cape, being 3,311 feet above the level of the sea: to the northward of the cape, this lofty range becomes lower and terminates at Weary bay.

The north point of Weary bay is a remarkable bluff, reddish cliff, nearly bare, from which the coast trends N. by W. $\frac{3}{4}$ W. about $15\frac{1}{2}$ miles to Walker point, the northern of two rocky projections, each surmounted by a hill; that on Walker point is 618 feet, and the other, which is a bare red-coloured peak, is 572 feet high: at $1\frac{1}{2}$ miles to the south-eastward of the latter, is Rocky islet, between which and Walker point, there is shoal water for half a mile from the shore; but its edge is steep-to.

A lofty range rises abruptly from the shore, $5\frac{1}{2}$ miles northward of Weary bay; the highest summit, which is nearly midway between Weary bay and Walker point, is 2,775 feet high. From this range to Walker point, the hills are separated from each other by mangrove flats.

Monkhouse point, N.W. by N. 5 miles from Walker point, is a high, round, reddish hillock, covered with long grass, but not wooded. The coast of the intermediate shallow and rocky bay is low, with isolated hills, between which the Annan and Esk rivers unite and flow into the bay.†

Pilot rock, with 9 feet on it and deeper water around, lies N. $\frac{1}{4}$ E. three-quarters of a mile from the outer extreme of Monkhouse point.

Mount Cook, W.N.W. $1\frac{1}{2}$ miles from Monkhouse point, is a remarkable conical hill, 1,476 feet high; and at N.N.W. $1\frac{3}{4}$ miles from it is Grassy hill, the south head of the entrance of Endeavour river.

DIRECTIONS.—From cape Tribulation to Weary bay, reefs and sunken rocks skirt the coast; but as they do not extend far off, and the water is deep close outside, the shore may be approached to about a mile.

From the northern point of Weary bay to Walker point, the coast is skirted by shoal water, which extends one quarter of a mile to two-thirds

* Lieutenant J. Dayman, in 1848, and Lieutenant W. Chimmo, in 1856, looked for this reef, but could see nothing of it.

† Mr. T. H. Hayman, Master H.M.S. *Salamander*, 1865, sounded the entrance of this river, and found it nearly filled up with sand-banks; there is a boat passage with 4 feet water, and inside 3 fathoms.

of a mile from the shore, and as there are no outlying dangers, this shore also may be safely neared to the distance of a mile, in 5 to 10 fathoms.

Care must be taken to keep well outside a line from Walker and Monkhouse points, the greater portion of the bay between being very shallow and rocky for nearly 2 miles out. Walker point in line with the extreme of the high land 7 miles southward of it, or Rocky islet open of Walker point, are good clearing marks for this, and also the Pilot rock, *see* page 246, and shoal water extending off the coast between Monkhouse point and Endeavour river.

ANCHORAGE.—Small vessels may obtain shelter from S.E. winds, under the point of the bay one mile northward of Walker point, by rounding the point at one cable distance and anchoring in 10 feet, low-water springs, about 3 cables westward of it.

HOPE ISLANDS, are small, low, and sandy with bushes, lying midway between cape Tribulation and Endeavour river; each island is surrounded by a reef, uncovered at low water, and always clearly seen. The reefs are parallel, lying N.N.W. and S.S.E., the western is $2\frac{1}{2}$ miles long and the eastern $1\frac{1}{2}$; between them is a clear channel, half a mile wide, in which the stream sets with velocity, causing a short, confused sea.

Anchorage.—There is tolerable anchorage in 9 fathoms, mud, under the lee of the Hope islands, sheltered from the prevailing south-east winds, at about a mile north-westward of the north-eastern isle. Care must be taken not to anchor in the stream.

DIRECTIONS for passing Beacons in the Inner Route.—Vessels bound northward must leave the *red triangular* beacons on the port hand, and those that are *black* and *square* on the starboard hand.

a. Reef, nearly half-way between the north-west extreme of Hope islands and the mainland, is a narrow ledge of coral, $1\frac{1}{2}$ miles long, N.N.W. and S.S.E.: rocks were seen on the reef by Captain Richards, and a few dry sand-patches, at low-water neaps. There is a clear channel about $1\frac{1}{2}$ miles wide, on each side of it.

A triangular red beacon is placed on the north-west extreme of **a.** reef.

b. Reef is a narrow shoal about $1\frac{1}{4}$ miles long, with a dry sand-bank on its south-east end, lying N.N.W. nearly 5 miles from the north-eastern Hope island; there is a small patch close to each end, and a coral spit extends a short distance from its eastern side. The channel between this reef and the mainland is clear, and nearly 5 miles wide.

A square black beacon marks the western side of **b.** reef.

Scott Rock, on which the sea breaks, is nearly midway between

b. and c. reefs; it was discovered by Mr. Scott, master of the schooner *Three Brothers*, in 1873. From the rock, mount Cook bears N.W. by W. $\frac{1}{2}$ W. and Rocky islet S.W. by W. Shoal water appeared to extend westward of the rock.

C. Reef, N.E. $\frac{3}{4}$ N. $2\frac{1}{2}$ miles from Walker point, is about 2 miles in circumference, with a small sand-bank on its north-west end, which is not covered at high water; with the exception of a 3-fathoms patch close to the north-western edge of this reef, it is steep-to all round, and there is a clear passage on each side of it.

A triangular red beacon is erected on the north end of C. reef.

d. Reef, which covers at high-water neaps, lies 2 miles to the eastward of Monkhouse point, is nearly the same size as C. reef, and has a sand-bank and some rocks on its north-west end; there is also a clear passage on each side of this reef.

A triangular red beacon is erected on the centre of the sand-bank on d. reef.

e. Reef, extends about $2\frac{3}{4}$ miles N.E. and S.W., and $1\frac{1}{2}$ miles across; the edges of it are steep-to, and may be safely approached to half a mile. Near the centre of the reef is a small patch of dry sand, E. by N. $\frac{1}{2}$ N. $7\frac{1}{2}$ miles from Monkhouse point. The whole of the reef, with the exception of the sand-bank, is covered at high water, and all the edges, but that on the south side, are covered at low water.

A square black beacon marks the west side of e. reef.

Turtle Reef is $2\frac{3}{4}$ miles long North and South, and 2 miles broad; it is steep-to, and has a small sand-bank above water on its north extreme, which lies N.E. 10 miles from Monkhouse point.

Anchorage.—There is good anchorage in 13 fathoms, sand and shells, at N.W. half a mile from the sand-bank.

ENDEAVOUR RIVER.—The entrance of this river is about half a mile wide, and formed on the south side, by Grassy hill, 570 feet high, with a signal station on it, and on the north side, by a scrubby sandy coast ridge 20 to 40 feet high, extending 2 miles to the northward: off the south extreme of this ridge is Sachs spit, which dries and extends half a mile E.N.E.*

Southward of Sachs spit the water is very shallow, drying in many parts at low water, and reaching nearly across the entrance of the river, causing the deep water channel or harbour to be not more than 200 to 400 feet wide.

* See Admiralty plan of Endeavour river, No. 1,072; scale, $m = 1.0$ inch.

Endeavour river is navigable 15 miles for boats, but being very tortuous the direct distance inland is then only 8 miles; the stream is fresh at 6 miles, in a direct line, above the bar.

The entrance of the river is fronted by a bar, on which, at low-water springs, there is not less than 10 feet; the channel over the bar, which is nearly half a mile wide, leads close to the south side, when the water deepens from 13 to 19 feet.

COOKTOWN.—This town, established in 1873, is built along the shore, on a flat space at the base of the west and south-west sides of Grassy hill, which slopes gently to the river. The town has a resident population of 3,000 whites and 5,000 Chinese.* The Australian company steamers call once a fortnight, and the Torres straits mail steamers both going and returning.

The Harbour is the port for the mining district of Palmer river, from whence large quantities of gold has been obtained; it consists of the narrow channel running close under Grassy hill and along the front of the town, a distance of about a mile. The north-eastern half of the harbour has a depth of from 14 to 19 feet, the southern part 7 to 9 feet. Several wharves extending to the deep water face the north-east end of the town. Vessels of moderate size entering the harbour must be prepared to moor head and stern, there being barely room to swing.

In consequence of the narrowness of the channel, and the want of available space for swinging within the port, masters of vessels are cautioned not to enter the harbour without a pilot. If, when they arrive off the port, the pilot is not available, they must either stand off and on until he is able to get out to them, or anchor off the mouth of the river in 6 fathoms, being careful to keep Walker point open of Monkhouse point.

Vessels entering the harbour during either monsoon should have their after canvas set, or in readiness to set, as the winds under Grassy hill are baffling, and the channel may be occupied by vessels steaming or warping out. Sailing vessels should also be provided with good long lines and handy kedges, as, during the S.E. monsoon, vessels always have to be warped out of the river.

LIGHTS.—Two leading lights are exhibited from above the sheds on Nos. 1 and 2 wharves, at Cooktown. The lights are *fixed red* lights, and kept in line lead over the bar in the deepest water, and through the channel towards wharf No. 1.

TIDES.—It is high water, full and change, in Cooktown harbour, at 9h. 15m.; springs rise 7 to 9 feet, neaps 5 feet. At the bar at 8h.; springs rise from 5 to 10 feet.

* "Australasia," A. R. Wallace, 1879.

Tide Signals.—The following tidal signals, for the use of vessels about to enter Endeavour river, will be made from the yard-arms of the flagstaff at the signal station, Grassy hill.

Depth of Water on bar.		Signals.
ft.	in.	
10	0	Ball at north yard-arm.
10	6	Ball at north yard-arm, dipped.
11	0	Ball at south yard-arm.
11	6	Ball at south yard-arm, dipped.
12	0	Two balls at north yard-arm.
12	6	Two balls at north yard-arm, dipped.
13	0	Two balls at south yard-arm.
13	6	Two balls at south yard-arm, dipped.
14	0	Ball at each yard-arm.
14	6	Ball at each yard-arm, dipped.
15	0	Flag over ball north yard-arm.
15	6	Flag over ball north yard-arm, dipped.
16	0	Flag over ball south yard-arm.
16	6	Flag over ball south yard-arm, dipped.
17	0	Ball over flag north yard-arm.
17	6	Ball over flag north yard-arm, dipped.
18	0	Ball over flag south yard-arm.
18	6	Ball over flag south yard-arm, dipped.
19	0	Ball north yard-arm, flag south yard-arm.

During flood tide a red burgee will be flown from a detached pole near the flagstaff.

DIRECTIONS.—The approach to Endeavour river from the northward is easy, and mount Cook is an unmistakeable mark for the entrance, but vessels coming from the southward, should, after passing Rocky island, bring the peak of Monkhouse point open eastward of mount Cook, steer in on that course, to clear *c.* and *d.* reefs, and when Rocky islet comes open of Walker point, keep it so, until Mahmie peak is in line with west point of Cook's landing S.S.W. $\frac{3}{4}$ W.; the outer (north) end of a galvanized iron roof on the north wharf will then be plainly seen immediately under the summit of Mahmie peak. Keeping these marks on will lead in over the bar in the deepest water (10 feet low-water ordinary springs), leaving two black buoys on the port hand, and a small red one on Sachs spit on the starboard hand.

Pilot rock, with 9 feet upon it at low-water springs, on the edge of the 3-fathoms line, at nearly one mile off Monkhouse point, with the summit of mount Cook bearing W. by S. $\frac{3}{4}$ S., is an outlying danger to vessels coming from or going to the southward. The water for some distance in shore is from 3 to 6 feet deeper than on the shoal, and to the eastward the bank extends from it about $1\frac{1}{2}$ cables, carrying from 15 to 18 feet of water, which then deepens to 4, 6, and 7 fathoms.

Vessels will be clear of this danger and of the edge of the bank while keeping Rocky islet open of Walker point, and of the Rocky point to the southward.

Two other (warping) buoys, chequered red and black, will then be seen, and may be passed on either hand. The channel here contracts to a width of 200 feet, and as the flood stream runs from $1\frac{1}{2}$ to 2 knots, long vessels entering with the flood should have a stream anchor and warp in readiness to anchor by the stern.

The necessary directions will be given from the signal station on the the summit of Grassy hill, to vessels arriving off Endeavour river.

Vessels entering Cook harbour at night, should steer with the leading lights in line, until near wharf No. 1, when any available berth at the wharves will be seen.

Leaving Endeavour river, a vessel steering to the northward, should shape a course outside cape Bedford; the soundings being regular and the water deep. If working to windward she should not stand inshore within the 5-fathoms line, as no soundings have been obtained within it.

The COAST.—From the north end of the sandy beach northward of Endeavour river, a range of hills rises abruptly, and extends N.N.E. 7 miles, where it terminates, and is succeeded by a series of low sand-hills, slightly covered with vegetation, as far as cape Bedford.

The coast between capes Bedford and Flattery forms a bay 6 miles in depth, but it is too much exposed to winds from East and S.E. to afford safe anchorage. The coast range is composed of low sand-hills covered with stunted vegetation. A narrow opening in the mangroves, in the extreme depth of the bay, appears to be the outlet of a small stream; a coral reef lies 2 miles to the south-eastward of it. The shores of the bay not having been examined, should not be approached within 4 fathoms. The sand-hills northward of the opening are of a bright red colour.

CAPE BEDFORD is a remarkable range of hills, of sand-stone formation, 3 miles long N.W. by N. and S.E. by S., at the north extreme it is 818 feet high, and is connected with the mainland by a low sandy isthmus 2 miles long. From the eastward the cape appears like three distinct hills the two northern are flat-topped, but the southern is more pointed.

Between one and 2 miles to the eastward of cape Bedford the soundings are irregular, varying from $3\frac{1}{2}$ to 8 fathoms; the northern part should not be approached within $1\frac{1}{2}$ miles. In the deep bight formed on the western side of the cape the water shoals gradually to the shore, but it is shallow, there being only $3\frac{1}{2}$ fathoms at $2\frac{1}{2}$ miles from the beach.

Anchorage, in case of need, may be had $2\frac{1}{2}$ miles north-westward of the cape; but it cannot be recommended, on account of the heavy swell.

CAPE FLATTERY, N. $\frac{1}{2}$ W. 15 miles from cape Bedford, to which it is somewhat similar, its face being 2 miles long N. by W. and S. by E.

and the north extreme 863 feet high, with another hill close to the north shore 2 miles westward of it, 712 feet high; the remaining portion of the promontory consists of low sand-hills. The cape should not be approached nearer than a mile, as within that distance the soundings are irregular.

A shoal-patch of sand extends N.W. by N. $2\frac{1}{2}$ miles from the eastern peak of cape Flattery; the least depth found upon it was $2\frac{1}{2}$ fathoms, but it will be easily seen by the pale colour of the water. High rock between South Direction island and Rocky islets, clears the north end of the shoal, and capes Flattery and Bedford in line the eastern.

Conical Rock, visible at a distance of 6 or 7 miles, lies near the middle of the bay just noticed, and N. by W. $\frac{1}{2}$ W. $5\frac{1}{2}$ miles from cape Bedford; it may be approached to half a mile on the eastern side, but to the westward, a coral reef, with a dry sand-bank on the end of it, extends nearly $1\frac{1}{2}$ miles towards the land. Between the western end of the reef and the shore there is a passage with 6 fathoms in it.

THREE ISLES, N.N.E. $\frac{1}{2}$ E. 9 miles from cape Bedford, are small and form a cluster, surrounded by a reef 3 miles in circumference; under the lee of which, there is good anchorage in 12 fathoms, mud, at half a mile from the reef. The western isle is very low, and covered with grass and a few high trees, visible 5 or 6 miles off; the eastern islet is overrun with mangroves; and the southern is very small, with a few trees upon it. The reef round this group is nearly uncovered at low water.

LOW WOODED ISLE, W.N.W. $2\frac{1}{2}$ miles from the westernmost of the Three isles, is $1\frac{1}{2}$ miles in circumference, and fringed by a reef, which is steep-to, except about its north-west end. The channel between it and the Three isles is considered to be clear of dangers.*

TWO ISLES are low, well wooded, and surrounded by a reef about 2 miles in circumference, which is steep-to, and affords good anchorage in from 13 to 15 fathoms, under its lee. One islet is on the eastern edge, and the other, which lies E. by S. $\frac{1}{2}$ S. $5\frac{1}{2}$ miles from the south point of cape Flattery, on the north-west edge of the reef.

LOOK-OUT POINT, N.W. $\frac{1}{2}$ W. $9\frac{1}{2}$ miles from cape Flattery, is remarkable only when seen from N.W. and S.E.; it is a round bare hillock of a red colour, and higher than the sand-hills at the back of it. A remarkable sand patch, seen from the northward, lies 5 miles S.W. $\frac{3}{4}$ W. from the point.

* A covered reef was said to exist nearly half-way between the Three isles and Conical rock, but although searched for by the *Rattlesnake* and *Bramble*, and afterwards by the *Torch* in 1856, also H.M. ships *Salamander* and *Virago* in 1867, 1869, it was not seen; it is therefore probably a patch of discoloured water.

Between the point and cape the coast forms a bay, with a sandy beach backed by low sand-hills. In approaching the shore the same precaution should be observed as in the bays to the southward.

Caution must be observed in rounding Look-out point, as the shoal water which fills up the bay beyond extends $1\frac{3}{4}$ miles northward and westward of the point.

i. Reef, is about $1\frac{3}{4}$ miles in circumference, with an uncovered sand-bank on its north-west end, N.E. by E. $\frac{1}{4}$ E. 8 miles from cape Flattery. There are masses of rock upon its edges; and three shoal patches, the outer having 3 fathoms on it, extend from half a mile to 2 miles south-westward of the reef.

ROCKY ISLETS which are wooded are three in number, and surrounded by a reef $3\frac{1}{2}$ miles in circumference; the largest islet lies 2 miles to the northward of the sand-bank on **i.** reef; the southern edge of the reef is steep-to; but foul ground extends $2\frac{1}{2}$ miles to the north-westward of the islets, as it does nearly the same distance to the south-westward of **i.** reef. These reefs and islets should, therefore, not be approached without great caution.

I. and III. Reefs, lying respectively, E.S.E. $2\frac{1}{2}$ miles, and E.N.E. $2\frac{3}{4}$ miles from Look-out point, form the south-west portion of a series of reefs extending nearly across the Inner route, from Look-out point to Lizard island. **I.** reef has a shifting sand-bank on it which is usually above water, with a chain of dangerous rocks extending $1\frac{1}{2}$ miles to the south-eastward. **III.** reef is covered.

A triangular red beacon is placed on the centre of **I.** reef.

l. Reef is 4 miles in circumference, and has a small sand-bank near its north-west end, bearing N.E. by E. $\frac{1}{4}$ E. 7 miles from Look-out point. A small detached reef, with some rocks covered at high water, lies half a mile to the westward of **l.** reef; there is no safe channel between them.

m. Reef is $2\frac{1}{2}$ miles long East and West, and $1\frac{1}{2}$ miles broad: there is a sand-bank on its west end, $1\frac{1}{2}$ miles to the northward of that on **l.** reef; and a small detached covered patch lies close to the north side of the reef.

Although there is deep water between **l.** and **m.** reefs, the passage is too narrow to be recommended.*

EAGLE ISLET, which is small, low, and woody, lies N.E. $\frac{1}{4}$ N. $11\frac{1}{2}$ miles from Look-out point, and is situated at the northern end of

* A reef has been said to lie at about $2\frac{1}{2}$ miles to the southward of **l.** reef, but it was not seen by the boats of the *Rattlesnake*. H.M.S. *Virago* searched for it in 1869, but with no success.

a reef 3 miles long N.E. by N. and S.W. by S., and $1\frac{1}{4}$ miles broad. A sand-bank extends along the whole of the western side of the reef, and there is good anchorage under its lee. A 3-fathoms ledge skirts the north-west edge, and a small patch lies close to the northward of the south-west extreme of the reef; with these exceptions there is deep water all round it.

The channel between Eagle islet and **m.** reef is one mile wide, and free from all dangers, except the covered patch close to the northern edge of **m.** reef, already mentioned.

LIZARD ISLAND, 15 miles N.E. $\frac{1}{4}$ E. from Look-out point, is $2\frac{1}{4}$ miles long North and South, and 2 miles broad; and is remarkable for its peaked summit, of granitic formation, which being 1,167 feet above the level of the sea, is an excellent mark for any vessel entering the Inner route from seaward, through the safe opening in the Great Barrier reefs to the eastward of the island.*

A grassy valley extends across, between the high ridges of hills occupying the northern portion, and the lower ones forming the southern part of the island.

A reef projects $1\frac{1}{4}$ miles to the southward from the island, and encloses on the outer edge three islets, of which two are high and rocky.

Anchorage.—The best anchorage is in $6\frac{1}{2}$ fathoms, sand, in a bay on the western side of Lizard island, at half a mile from the shore; but in steering for it from the southward, a vessel should not approach the island nearer than a mile, as a continuation of the reef enclosing the southern part of the island, extends as far to the northward as the south point of the bay; when this point is in line with the peak of the island, a course steered for the centre of the bay leads to the anchorage.

The east side of Lizard island is steep-to; but a reef with a small sand-bank on its north-west end, covered at high water, lies $1\frac{1}{4}$ miles off shore; there is deep water all round it.

Water.—A stream—varying in size, according to the season of the year—runs from the valley into the south end of the anchorage; the best watering place is in a small bay at the north-west end of the island, where the water is of a better quality than that obtained from the valley. The island is not thickly wooded, but an abundance of firewood may be easily obtained. Natives visit Lizard island occasionally.

TIDES.—It is high water, full and change, at Lizard island, and along the coast southward to cape Tribulation, at 9h 15m.; rise from 7 to 10 feet.

* See Admiralty chart of Australia, east coast, sheet XVIII., cape Flattery to cape Sidmouth, and the Barrier reefs, No. 2,352; scale, $\text{m} = 0.25$ of an inch.

The COAST.—The bay formed between Look-out and Murdoch points is 5 miles deep, but it is completely filled up with shoal water, coral reefs, and patches of rocks. The coast of the bay is low with sand-hills, and covered with mangroves, in which are several openings.

Murdoch Point, N.W. by W. $\frac{1}{4}$ W. $21\frac{3}{4}$ miles from Look-out point, is a low, rounded, and ill-defined projection, with some large trees upon it. The point is fronted by a reef extending $1\frac{1}{4}$ miles off, it begins one mile south-eastward of the point, and runs parallel to the land for $2\frac{1}{2}$ miles; at the south-east corner of the reef is a cluster of dry rocks.

Q. Islets, two in number, are small and rocky, lying close to the edge of the shoals, nearly half way between Look-out and Murdoch points, and 5 miles from the mainland; they are good marks for clearing the shoal water, and a vessel may anchor in 4 fathoms, three-quarters of a mile to the north-westward of the eastern islet.

Turtle Group consists of six low woody islets, surrounded by coral reefs, two dry sand-banks, and two covered reefs, occupying a triangular space about 3 miles in extent; the two covered reefs form the south-east and west angles of the group, and the northernmost islet lies N. by W. $7\frac{3}{4}$ miles from Look-out point.

Mr. Brown, the commander of the S.St. *Gunga*, reports the existence of a shoal over which that vessel grazed in 1878, and on which he considers there probably would not be more than 12 feet at low-water, lying one mile northward of the north island of the Turtle group, and with that island in line with Look-out point. Nothing less than 7 fathoms was found by the lead.

DIRECTIONS.—The anchorage is not good under the lee of the Turtle group; but the passage between them and the mainland is clear; and by keeping the east point of cape Flattery touching the outer extreme of Look-out point, a vessel will be clear of all danger, up to the passage between Howick group and Cole islands.

N. ISLET is small, low, and wooded, lying W. by N. $\frac{1}{2}$ N. $7\frac{1}{2}$ miles from Eagle isle; it is surrounded by a reef, which, on the north side has a shoal spit projecting half a mile N.N.W., the islet should not be approached within $1\frac{1}{4}$ miles. There is good anchorage in 9 fathoms, mud, under the lee of the reef, at about three-quarters of a mile from the edge.*

The COAST between Murdoch and Barrow points, a distance of $21\frac{1}{2}$ miles N.W. $\frac{1}{2}$ W., forms three bays, divided by Red point and cape Bowen. The shores of these bays are low, consisting of a succession of mangroves, rocky points, and sandy beaches. Between Murdoch point

* Two coral reefs are described by Captain King as lying about W. by N. from one to 8 miles from n. islet; but the boats of H.M.S. *Rattlesnake* could not discover them. As the positions assigned to the supposed dangers nearly border the main channel, they should be carefully looked for by any vessel passing.

and cape Bowen, shoal water extends from 2 to 4 miles from the shore, upon the outer edge of which are the Cole islands and Noble island. A coral reef skirts the shore from cape Bowen to Barrow point, with shoal water outside, extending from one to 2 miles from the land.

Red Point, W.N.W. 9 miles from Murdoch point, is only remarkable for its red colour and from its forming the northern termination of some hills behind it. Midway of the two points and $1\frac{1}{4}$ miles inland is Brown peak, 538 feet high.

Cape Bowen, W. by N. $\frac{1}{2}$ N. $6\frac{1}{2}$ miles from Red point, is the north-eastern extremity of an isolated range of barren rocky hills, from 1,600 to 1,934 feet high, and remarkable for the basaltic columns upon them. The land is low north and south of these hills, the soil appearing rich at their base; there are many breaks in the beach, probably the outlets of fresh-water rivulets.

BARROW POINT, the extreme of a narrow peninsula, projecting upwards of 2 miles north-eastward from the low coast, is of moderate elevation, and presents a most barren appearance; half a mile northward of it, is Barrow island, surrounded by a coral reef, projecting half a mile: the reef is steep-to, and may be approached to one quarter of a mile.

Lieutenant I. S. Roe, R.N., says two small patches of coral, under water, lie N.E. by E. $1\frac{1}{4}$ miles from Barrow point; they bear N.E. and S.W. from each other, and are probably a cable's length apart.*

Mr. Edwards, Master of the Australian barque *Woodlark*, also says these reported dangers exist; but they were not seen by the boats of H.M.S. *Rattlesnake*, nor from the mast-heads of that ship and the *Bramble*; nor were they seen by Captain Richards, H.M.S. *Hecate*, in 1863.†

Clearing marks.—Brown peak kept just open west of Noble island, bearing S.E. by S., leads clear of danger, in mid-channel, past Barrow point.

Detached patches of rocks awash, lie on the east side of the channel formed by Barrow point and the **g.**, **t.**, **u.**, reefs; see page 262. From these rocky patches Barrow island bears W. by S., 3 miles, and the mangroves on the south-west side of **g.** reef are in line with the east end of No. 6, Howick group, bearing S.E. by E. nearly.

ASPECT.—A high range of flat-topped hills rises 11 miles to the south-west of Look-out point, and trending to the north-west, a branch approaches the coast, terminating at Round hill, 13 miles to the westward of Look-out point. The main range, which rises in some parts to nearly 1,500 feet in height, takes a more westerly direction, nearly joining the heights at the back of cape Bowen. This chain of mountains runs nearly

* Captain King's Australia. Vol. II., p. 287.

† Commander G. S. Nares, H.M.S. *Salamander*, who in 1867 searched for this rock without success, believes in its existence, having confidence in Mr. Edwards' judgment.

parallel with the coast, from which it is distant from 7 to 10 miles. The intermediate country is low and thickly wooded, with a few hills of moderate elevation.

Cole Islands, numbered I., II., III., and IV., are low and wooded; they are situated on the edge of the shoal water extending from the shore to the north-westward of Murdoch point, the most northern and western islands, III. and IV., lying about 4 miles from the mainland; each island is fringed by a narrow reef. There are two dry sand-banks, one at $1\frac{1}{2}$ miles and the other three-quarters of a mile, N.W. $\frac{1}{2}$ W. and N.W. by W. $\frac{1}{4}$ W. respectively of the west extreme of IV. island; there is also a coral reef above water, about half a mile to the southward of the southern sand-bank. No available channels exist between the Cole islands, nor between them and the mainland.

r. and rr. REEFS are two small coral patches close to the eastward of Cole islets; the former lies 5 miles, and the latter $3\frac{1}{2}$ miles N. $\frac{1}{2}$ W. of Murdoch point; **r.** reef has a patch of sand on its southern end, and **rr.** reef is awash. A rock about one quarter of a mile long and 60 yards wide, lies $2\frac{1}{2}$ cables north-east of **r.** reef.

Beacon.—A triangular red beacon is erected on the rock north-east of **r.** reef.

Noble Island, barren and rocky, is $1\frac{1}{2}$ miles in circumference, lying about half way between Murdoch and Barrow points, and N. by W. $\frac{3}{4}$ W. $2\frac{1}{2}$ miles from Red point. On the eastern side of the island is a remarkable peak 338 feet high, and on its southern end are two rocky mounds; a low wooded point runs out half a mile from the west side of the island, and nearly joins the outer edge of the shoal water extending from the mainland.

Noble island affords no good anchorage; but it is a conspicuous object from every direction; appearing from the southward to have a double top, and from the northward, a single one. It appears to be destitute of fresh water. A sand-bank, which dries at low water, with from 4 to 6 fathoms round it, lies W. by N. $\frac{1}{2}$ N. 4 miles from Noble island.

MEGÆRA ROCK.—H.M.S. *Megara*, in 1858, is said to have passed a pinnacle rock, supposed to have about 6 feet water over it, lying in the fairway, at about N.W. by W. $\frac{3}{4}$ W. 12 miles from **n.** islet. In 1863, H.M.S. *Hecate* passed over, and searched the position assigned to this rock; but nothing whatever was seen of it.*

* In 1869 H.M.S. *Virago* passed close to the position assigned to this danger, but it was not seen. In 1874, Captain G. S. Nares, H.M.S. *Challenger*, remarks there was a report that the *Megara* rock had been seen again lately; vessels therefore navigating near the supposed position of this danger should use great caution.

HOWICK GROUP consists of 10 small islands extending from $6\frac{1}{2}$ miles N.E. by N. of Murdoch point, to $11\frac{1}{4}$ miles N.N.E. of Noble island.

I. Island, the largest of the group, is $2\frac{3}{4}$ miles long East and West, and $1\frac{1}{2}$ miles broad: there are two remarkable peaks on its east end, about 180 feet high, the higher of which bears N.N.E. nearly 8 miles from Murdoch point. The north-west end of the island consists of a mass of dry sand, the remaining portion is covered with mangroves, and the whole island is fringed by a narrow coral reef, generally not extending more than half a cable's length from high-water mark.

A coral reef lies in the centre of the channel, $1\frac{1}{4}$ miles wide, between the north side of the island and the edge of the Barrier; although there is deep water on either side of the reef, the passage should not be attempted.

Anchorage.—The anchorage under the lee of the island is good, in $6\frac{1}{2}$ fathoms, mud, at about half a mile from the shore.

II. and III. Islands are small, low, wooded, and surrounded by a narrow reef; the former lies half a mile South, and the latter $1\frac{1}{2}$ miles to the south-eastward of the east end of I. island. Natives visit these islands occasionally.

IV. and V. Islands are small and low, the former lies W.S.W. $1\frac{1}{2}$ miles, and the latter $3\frac{1}{2}$ miles N.W. by W. of the west point of I. island; each island is encircled by a narrow fringe of coral.

VI. Island, also low, and bushy, is about 2 miles in circumference, and lies W. by N. $\frac{1}{2}$ N. $10\frac{1}{2}$ miles from the peak of I. island; it is surrounded by a coral reef, narrow on the west, but extending two-thirds of a mile from its north-east side.

Anchorage.—There is good anchorage in 9 fathoms, mud, under the lee of this island, at about a mile from its north-west side.

VII. and VIII. Islands.—The former is a long cluster of mangrove bushes, of which the latter is the north-west termination; both are on the same coral reef, which is about $4\frac{1}{2}$ miles in circumference, its south-east extreme lying N.W. $\frac{1}{2}$ W. 6 miles from the peak of I. island; the edge of the reef is steep-to on its south-west side.

IX. and X. Islands are two sand-banks on the western edges of separate reefs, the former is $1\frac{1}{2}$ miles north-east of VIII. island, with a deep water passage between the reefs, and is about one mile long N.W. by W. and S.E. by E.; the latter is very small with bushes on it, and lies $5\frac{1}{2}$ miles N.N.W. from VIII. island.

Harrington Rock, reported as having been passed close to by the British ship *England* in 1874, appeared to have a depth of 5 or 6 feet

over it; from the ship, No. 3 Howick island bore N. by E. distant about $1\frac{1}{4}$ miles; and No. 2 Cole island, West, about 4 miles.

Ninian Bay, between Barrow and North Bay points, is 7 miles across S.E. by S. and N.W. by N. and nearly 3 miles in depth; but it is entirely filled up with shoal water, and a small coral reef in the middle, preventing even a small vessel from obtaining shelter under Barrow point. The outer edge of the shallow bank is steep-to, and can be easily avoided by keeping Noble island well open to the eastward of Barrow island.

The land about the head of the bay is low and well wooded, the shore consisting of rocky points and sandy beaches, but to the northward it is high, rocky, and barren.

Broomfield Rock, reported as having been struck on by the schooner *Hannah Broomfield* in 1873, is described as a mushroom-shaped coral patch, with about 4 feet water over it and 15 fathoms close-to. From the rock, cape Melville bears W. by N. $\frac{1}{2}$ N., Barrow point S. by E., and Rocky point S.W. by W. $\frac{1}{2}$ W.

CAPE MELVILLE, the north-eastern extreme of which is the northern termination of a high range of rocky hills, rising from 902 feet in height, at about a mile southward of the cape, to 1,740 feet, $2\frac{1}{2}$ miles farther inland. This singular promontory is remarkable for the heaps of immense blocks of granite strewn over it, some of which look as if they had been thrown into the sea, forming a continuous border of foul ground, with rocks above water, from North Bay point to the extremity of the cape, and extending from half a mile to $1\frac{1}{4}$ miles from the steep rocky shore.

Inside one of these rocky islets, at about $1\frac{1}{2}$ miles to the south-eastward of cape Melville, a rill of fresh water was seen running into a mangrove creek, from a small valley on the mainland.*

CHANNEL ROCK.—This dangerous rock, just above water, and awash at high water springs, lies about N.N.W. $\frac{1}{2}$ W. $1\frac{3}{4}$ miles from the north-west extreme of cape Melville; there are several other rocks of a larger size between it and the shore, the largest of which is 30 feet high and named the Boulder rock. A vessel may pass, in 9 fathoms water, between Channel and Boulder rocks, but the passage is too narrow to be recommended.

PIPON ISLETS, North $2\frac{1}{2}$ miles from cape Melville, are two low wooded islets on the southern end of a reef 4 miles in circumference, upon which are also two sand-banks and some mangrove bushes near its north-west and south-west edges; the reef is steep-to, and there is good

* Captain F. P. Blackwood, R.N., was here attacked by the natives when shoving off in his boat after obtaining observations.

anchorage in 9 fathoms, mud, under its lee, at about half a mile from the edge.

Beacon.—A square black beacon marks the south extremity of the reef.

LIGHT.—A light-vessel is placed in lat. $14^{\circ} 7' 30''$ S., long. $144^{\circ} 31' 30''$ E., on the north side of Channel rock, north-west of cape Melville, in 14 fathoms water, with the following bearings, Pipon islets beacon E. $\frac{3}{4}$ N., and Channel rock S. $\frac{1}{2}$ W. The light-vessel exhibits a *fixed* white light, elevated 35 feet above the sea, and visible in clear weather for about 10 miles. Vessels rounding cape Melville should pass north of this light-vessel.

MELANIE ROCK with only 3 feet on it at low water, is about half a mile in extent and shaped like a half-moon; it lies $2\frac{3}{4}$ miles N.E. by E. $\frac{1}{2}$ E. from the eastern end of the Pipon islets reef. About $1\frac{1}{2}$ miles eastward of the rock is a coral patch with 2 fathoms over it. See page 263.

The peak of North Bay point kept eastward of the peak 1,626 feet high near cape Bowen, leads to the westward of Melanie rock.

Oswald Reef.—This reef on which the British ship *Jennie Oswald* is reported to have struck in 1872, is said to have one fathom on it at low water, and to lie $1\frac{1}{4}$ miles to the north-westward of the Pipon islets.

GREAT BARRIER REEFS FROM ABREAST OF CAPE GLOUCESTER TO CAPE MELVILLE.

The outer edge of the Great Barrier reefs, from 95 miles E. by N. of cape Gloucester, was traced by Captain Denham, in a W. by N. $\frac{1}{4}$ N. direction, nearly 140 miles to Flinders passage, in lat. $18^{\circ} 50'$ S., long. $148^{\circ} 8'$ E. From this opening, the probable outer edge of the barrier trends north-westward about 180 miles to Trinity opening, 20 miles to the northward of cape Grafton.*

INNER LIMITS of the BARRIER.—Immediately on the north-west side of the reef, bearing N.N.E. 15 miles from Hayman island, is an opening 12 miles broad S.E. and N.W., with more than 30 fathoms water across it. It has not been ascertained whether this opening continues out to sea or not, but it is more than probable that it does not, or Captain Flinders, who examined this part of the reef, would have availed himself of it, when seeking for a passage out to sea.†

* See Admiralty chart, Coral sea, sheet I., Great Barrier reefs of Australia, No. 2,763; scale, $m = 0.04$ of an inch.

† See Admiralty chart of Australia, east coast, sheet XIV., Queensland, Whitsunday island to Magnetic island, No. 348; scale, $m = 0.25$ of an inch.

From the north-west side of this opening the inner edges of the Barrier reefs trend about W. $\frac{3}{4}$ N. 21 miles, when the reefs recede to the northward, forming a bight, with scattered patches in it, and extending W. by N. 30 miles across to a large detached reef, at about N.N.E. 25 or 26 miles from cape Upstart. This reef (of which the south-western end has not been traced) is separated from the south-east point of Flinders passage by a deep passage 2 miles wide.

FLINDERS PASSAGE.—The inner, or southern entrance of this channel, is 11 miles broad S.E. and N.W., and lies about N. by E. 35 miles from cape Upstart. The general direction of the channel is North and South; it is bounded on either side by reefs, is 21 miles long, and from 3 to 5 miles broad; the depth is irregular, varying from 19 to 45 fathoms. There are two detached patches in the outer entrance of the channel, the north-western of the two lying in lat. $18^{\circ} 51'$ S. and about long. $148^{\circ} 1'$ E. At 10 miles to the north-eastward of this entrance the depth is 45 fathoms, coral sand and shells.

SLASHER REEF, about N.E. by E. $\frac{1}{4}$ E. 25 miles from Great Palm island, may be a part of the inner limits of the Barrier reefs, if they continue thus far from Flinders passage; at present the space between this channel and Slasher reef remains a blank on the Admiralty chart; but the absence of any ocean swell between cape Cleveland and the Palm islands goes far to prove that this space of 60 miles is not unoccupied by reefs, forming in some shape a continuation of the barrier from Flinders passage to Slasher reef.*

From Slasher reef to cape Grafton, the inner limits of the barrier seen have been a series of large detached reefs, of which the inner edges only have been traced.

BRAMBLE REEF, about E. by N. 17 miles from Hillock point of Hinchinbrook island, is the next portion of the inner limits of the barrier seen to the northward and westward of Slasher reef; its inner edge, which is steep-to, was traced about 6 miles from S.E. to N.W.

BRITOMART REEF.—The inner edge of this reef extends from about 5 to 10 miles northward from Bramble reef, and is also steep-to. The opening between these two reefs is deep, the soundings varying from 16 to 30 fathoms.

The next reef, which is smaller than the two just mentioned, lies 5 miles to the eastward of Kennedy shoal; the soundings between them are irregular, ranging from 6 to 21 fathoms, the deepest water being near Kennedy shoal.

* See Admiralty chart, east coast of Australia, sheet XV., Magnetic island to Double point and the Barrier reefs, No. 2,349; scale, $\pi = 0.25$ of an inch.

From a reef with a dry sand-bank on it, N.E. by E. $\frac{1}{2}$ E. 20 miles from the southern summit of Dunk island, the inner limits of the barrier preserve a somewhat more regular order, the general direction being about N.N.W. 56 miles, to a dry sand-bank on the north-west end of a large reef, E. $\frac{1}{2}$ S. $9\frac{1}{2}$ miles from Fitzroy island.*

GREEN ISLET, N. by E. $\frac{1}{2}$ E. 8 miles from cape Grafton, is low, wooded, and conspicuous, from the trees on it being about 120 feet high; it is situated $1\frac{1}{2}$ miles inside the south-western edge of a reef, the extent of which has not been ascertained. This islet should be approached with great caution from the southward, as numerous dangerous patches skirt the reef in that direction, some of them extending above a mile from the reef, or nearly 3 miles from the islet. There is good anchorage in 10 and 12 fathoms westward of the island, close up to the edge of the reef; and the channel between it and cape Grafton is free from danger. See page 237.

Oyster Cay is the north-eastern of two sand-banks on the next reef to the northward of Green islet, one lying N.W. $\frac{1}{2}$ N. $5\frac{1}{2}$ miles, and Oyster cay N. by W. $8\frac{1}{2}$ miles from the islet. The former is on the western, and the latter on the north-western edge of a reef, extending S.W. and N.E. about 10 miles, and forming the south-east side of Trinity opening.

Oyster cay is slightly vegetated, and produces a glutinous kind of spinach: at certain seasons of the year great quantities of wholesome birds' eggs may be procured on the islet, and oysters from the rocks near it.

TRINITY OPENING is a broad channel leading from the sea into Trinity bay, between Oyster cay and an extensive reef 10 miles to the north-westward of it. The soundings are irregular varying from 14 to 31 fathoms; the 100-fathoms edge of the bank being about 12 miles outside the centre of the opening. A small reef with a patch of sand on it, lies W.N.W. $6\frac{1}{2}$ miles from Oyster cay; and at N.N.E. $\frac{1}{2}$ E. $3\frac{1}{2}$ miles from the cay is a small sunken patch at about a mile from the edge of the reef; besides these, numerous detached reefs and patches of coral lie scattered in mid-channel; and as it has not been closely sounded, many other dangers probably remain undiscovered in it. See page 237.

The OUTER EDGE of the BARRIER for the first 14 miles to the northward of Trinity opening, is broken and irregular,

* See Admiralty chart of Australia, east coast, sheet XVI., Double point to cape Tribulation and the Barrier reefs, No. 2,350; scale, $m = 0.25$ of an inch.

This sand-bank may be one of the two sandy islands reported to have been seen by Lieutenant C. Jeffreys, neither of which was seen from the mast-head of H.M.S. *Bramble*, in the position assigned to it; nor could the shoal, 10 miles eastward of the high Frankland isle, on which the *Mermaid* was supposed to have been wrecked.

with detached reefs and soundings outside the general direction of this edge of the barrier.*

At 23 miles to the eastward of cape Tribulation the outer edge of the Great barrier reefs is first known to assume a uniform and well defined character; it continues from thence in a direct line N. by W., nearly parallel with the coast, for 90 miles, to abreast of Lizard island, and consists of a series of narrow curved reefs, awash at low water, from one to 4 miles long, and about half a mile broad, with their ends pointing towards the mainland, from which they are distant from 20 to 30 miles.

A vessel might pass safely through many of the numerous openings between these reefs, as far to the northward as the parallel of cape Flattery, from whence a long, narrow, unbroken reef extends to about 10 miles eastward of Lizard island.

The INNER LIMITS of the BARRIER, from Trinity opening, trend north-westward nearly 17 miles to a spit of foul ground, projecting from the edge of the reef to nearly E.N.E. 8 miles from Snapper island: the edge of this reef is uniform and steep-to.

From the spit just mentioned to the point of a reef, with a sand-bank on it, E. $\frac{1}{2}$ S. $9\frac{1}{2}$ miles from cape Tribulation, are numerous sunken coral patches, which are the more dangerous as they spring up like mushrooms, from a depth of 18 to 20 fathoms, the lead giving no warning of their proximity.

The space between the above sand-bank and another at 4 miles to the northward of it, is free from dangers, but numerous reefs and coral patches extend 4 miles to the northward of the latter sand-bank, when the sea again becomes clear of dangers for 7 miles.

At 10 miles to the eastward of the north point of Weary bay two sand-banks lie close together, on the north west extreme of a large reef; the inner edge of which was traced 4 miles to the south-eastward from the sand-banks, and is steep-to.

The next reef, N. by W. $\frac{1}{2}$ W. $4\frac{1}{2}$ miles from the two sand-banks, is steep-to on its south-west side, the only part seen; there is deep water North and South of the reef.

ENDEAVOUR REEF.—The south-west edge of this reef extends from 5 miles eastward of the Hope islands, to a mile eastward of b. reef, a distance of 7 miles. There is a clear channel, 2 miles wide, between Endeavour reef and the Hope islands; but none between it and b. reefs.

As the inner limits of the Great Barrier reefs, from the parallel of Snapper isle to Endeavour reef, are generally very irregular, and in many

* See Admiralty chart of Australia, east coast, sheet XVII., cape Tribulation to cape Flattery and the Barrier reefs, No. 2,351; scale, $\pi = 0.25$ of an inch.

parts thickly studded with small sunken patches, a vessel will find it more safe to borrow on the mainland, as that portion of the coast is generally bold to approach.

From Endeavour reef to abreast of cape Bedford, the inner limits of the barrier have not been defined; the only reefs there bordering the east side of the inner route being *e.* and Turtle reefs described at page 244.

f. Reef, 5 miles to the south-eastward of Three isles, is about 3 miles in extent, and steep-to on its western side.

g. Reef, N.E. by E. 6 miles from Two isles, was represented by Capt. King, to be about 3 miles long, North and South, and one mile broad; it is steep-to on its west side. Two sand-banks lie off its south extreme; one East $1\frac{1}{2}$ miles, and the other South $2\frac{1}{2}$ miles; a reef lies $2\frac{1}{2}$ miles to the eastward of the latter sand-bank.

h. Reef is said by Captain King, to be separated from *g.* reef by a channel one mile wide, its western edge extending from one to 4 miles to the southward of *i.* reef; *h.* reef should not be approached within 2 or 3 miles by vessels passing, as there are irregular soundings and foul ground near it.

SOUTH DIRECTION ISLAND, is high, rocky, 2 miles in circumference, and in shape like a quoin; the peak on its eastern end is 567 feet high, and bears S.S.E. $\frac{1}{4}$ E. $10\frac{1}{2}$ miles from Lizard island peak. High Rock, rising abruptly from the sea, lies E. by N. $\frac{1}{4}$ N. $1\frac{1}{2}$ miles, and a dry sand-bank on a coral reef close to the southward of the island, lies S.S.E. 2 miles from it.

From the peak of South Direction island numerous patches of coral can be seen in a south-easterly direction.

NORTH DIRECTION ISLAND, N. by W. $\frac{1}{4}$ W. $4\frac{1}{2}$ miles from South Direction island, and S.E. by S. $5\frac{1}{2}$ miles from the peak of Lizard island, is also rocky, and rises abruptly to an elevation of 610 feet.

H.M.S. *Fly* traversed amongst these islands, and found from 15 to 20 fathoms water on a coral sandy bottom; but there are some dangerous coral patches to the eastward of them, which rise so suddenly from a depth of 17 to 20 fathoms, that the lead gives no warning when approaching them.

k. Reef, with a dry sand-bank upon it, according to Captain King, lies about midway between North and South Direction islands.

The OUTER EDGE of the BARRIER from the parallel of Lizard island, first trends north-westward 18 miles, to a channel through the reef, $1\frac{1}{2}$ miles broad, N. by W. 14 miles from Lizard island peak. This portion of the barrier consists of reefs of irregular and oval shape, varying in length from one to 7 miles, and from half a mile to one mile in breadth

There are several deep openings between these reefs ; that through which Captain Cook passed out to sea, is half a mile in width, and lies N.E. $\frac{1}{4}$ N. $9\frac{1}{2}$ miles from Lizard island peak.*

ONE-AND-HALF-MILE OPENING, above noticed as being 14 miles to the northward of Lizard island, runs nearly North and South through the Barrier ; a vessel therefore, entering with the prevailing south-easterly winds, would have to make one or two tacks before getting into smooth water, and as a heavy sea and irregular tide streams are experienced in these passages, this, although comparatively a broad channel, has little to recommend it.

On the north-western side of the One-and-half mile opening the reef is much broader, a point of it extending $5\frac{1}{2}$ miles towards the mainland, when a very narrow gap in the reef afforded just room enough for the *Fly* and *Bramble* to pass through and continue their track to the north-westward, inside the outer edge of the barrier ; immediately after getting through this gap, numerous patches, nearly awash, were met with ; but having passed them, the water became more free from dangers, the depth varying from 9 to 20 fathoms.

From One-and-half-mile opening, the outer edge of the barrier trends nearly W.N.W. 37 miles to No. 1 Sand-bank, and is formed by a larger description of reefs, between which are many narrow openings ; but it would not be prudent for a vessel to attempt entering by either of them, except under necessitous circumstances. There is a passage three-quarters of a mile wide, at N.E. $\frac{1}{4}$ N. 18 miles from the highest peak of the Howick group ; but the space between it and the inner route, appears to be chiefly occupied by coral reefs.

No. 1 SAND-BANK OPENING is a clear channel, $1\frac{1}{4}$ miles broad. The dry sand-bank, on the western extreme of the reef forming the east side of the entrance, lies E. $\frac{1}{4}$ N. 20 miles from cape Melville, and about the same distance N.N.W. $\frac{1}{4}$ W. from the highest peak of the Howick group. This opening is in some degree subject to the same disadvantages as those just described to the south-eastward of it, on account of the reefs lying between it and the mainland ; although the water appears more clear of reefs in the direction of cape Bowen, by which a vessel might, if hard pressed, gain the Inner route.

SOUNDINGS in 68 fathoms were obtained by the *Fly*, at 3 miles outside the barrier, and at about 11 miles to the eastward of No. 1 Sand-bank ; these are the only instances of positive soundings having been

* See Admiralty chart of Australia, east coast, sheet XVIII., cape Flattery to cape Sidmouth and the Barrier reefs, No. 2,352 ; scale, $m = 0\cdot25$ of an inch ; also, Coral sea and Great Barrier reefs, sheet 2, No. 2,764 ; scale, $m = 0\cdot04$ of an inch.

found by the *Fly* and *Bramble*, outside the Great Barrier reefs, between cape Tribulation and Murray isles, bottom having been seldom reached even with 300 fathoms of line, close outside the barrier.

From No. 1 Sand-bank opening, the outer edge of the barrier takes a N.W. direction 20 miles, in one unbroken line, without even an apparent passage for a boat; it then turns sharply south-westward 2 miles to an opening three-quarters of a mile broad, lying N. by E. $\frac{1}{4}$ E. 13 miles from cape Melville.

The greater portion of this impenetrable part of the barrier appeared to be the outer, or weather edge of extensive fields of coral, reaching to within 4 miles of the mainland, southward of cape Melville.*

It should be observed that there is very little safe navigable water, immediately within the outer edge of the barrier, between the meridians of Lizard island and cape Melville, it being thickly strewn with dangerous sunken coral patches; and, unless necessity should compel a vessel to seek shelter inside, this part of the barrier should be avoided.

The INNER LIMITS of the BARRIER, from One-and-half-mile opening are first chiefly formed of detached reefs, with deep openings between, trending to the westward and joining the northern islets of the Howick group.

S. Reef, 5 miles to the eastward of Barrow point, is of oval shape, and 6 miles in circumference; its south-west side is steep-to, and partly dries at low water. *See page 252.*

Beacon.—A square black beacon marks the centre of the western edge of s. reef.

t. Reef, the next to the north-westward of s. reef, is $2\frac{1}{2}$ miles long E.S.E. and W.N.W., and lies E.N.E. $4\frac{1}{2}$ miles from Barrow point; its inner edge is steep-to.

U. Reef is small, with a sand-bank on its north-west extreme; it may always be seen, and its inner edge, the only part defined, is steep-to.

W. Reef is the western side of the extensive coral fields, through which the *Fly* and *Bramble* threaded their way from the outer barrier to cape Melville; its inner edge, which is steep-to, extends from u. reef, about N.N.W. $\frac{1}{4}$ W. $10\frac{1}{2}$ miles to 7 miles E.N.E. of cape Melville, but it has not been traced farther to the northward.

* H.M. ships *Fly* and *Bramble* crossed over these fields of coral to cape Melville, and it would be difficult to conceive more intricate navigation than was experienced in this short run. A flat with $3\frac{1}{2}$, 4, and 5 fathoms water on it, extended several miles, thickly covered with small heads of coral, like mushrooms, springing up from the bottom; these occasionally barely afforded room for the ships to wind their passage through them. The weather was, fortunately, fine, and the water very smooth at the time.

A detached patch of coral, with 2 fathoms water on it, lies N.E. $\frac{1}{4}$ N. 6 miles from cape Melville; a spit of foul ground runs out three-quarters of a mile to the south-eastward from the patch, which has otherwise deep water round it.

INNER ROUTE FROM CAPE GLOUCESTER TO CAPE MELVILLE.

From CAPE GLOUCESTER to the PALM ISLANDS the Inner route, after passing Holborn island, has not been sounded far enough off shore, to define any seaward boundary.* Captain King's tracks on the chart will therefore at present be the best guide, and a vessel should not keep outside of them at night, nor in the daytime, except with the usual precautions recommended when traversing-unknown waters.

On the south-west side, the channel is bounded by Gloucester island, the rocky islet off Abbott bay, capes Upstart, Bowling-green, and Cleveland, Magnetic, and the Palm islands.

The average known breadth of this portion of the Inner route is about 10 miles.

The soundings are regular, ranging from 6 to 32 fathoms, with generally a sandy or muddy bottom.

CAUTION.—Between cape Gloucester and the Palm islands, Nares rock, 30 feet high, 2 miles to the southward of Holborn island, capes Bowling-green and Cleveland, and the Chilcott rocks, appear to be the only dangers which demand particular attention, besides the supposed Zebra shoal and sunken patches to the eastward of the Palm islands.

From the PALM ISLANDS to CAPE GRAFTON the Inner route is bounded to the eastward by the Bramble and Britomart reefs, Kennedy shoal, and the inner edges of the barrier between the parallels of Dunk and Fitzroy islands.†

And to the westward by Hillock point, Eva islet off cape Sandwich, Hinchinbrook island; Brooke, Family, and Dunk islands; King reefs; the Barnard islands; the shoal spit running out from the mainland 5 miles to the north-westward of the High Frankland island; and cape Grafton.

The greatest breadth is 17 miles, between Bramble reef and Hillock point, and the least $8\frac{1}{2}$ miles, between Kennedy shoal and Brooke islands.

* See Admiralty chart of Australia, east coast, Queensland, Whitsunday island to Magnetic island, No. 348; scale, $m = 0.25$ of an inch.

† See Admiralty charts of Australia, east coast, sheets XV. and XVI., Nos. 2,349 and 2,350; scale, $m = 0.25$ of an inch.

The soundings are regular, the least depth being 5 fathoms, and the greatest 24 fathoms, with generally a sandy bottom. From about midway between Double and Cooper points to Fitzroy island, the soundings are very regular from 3 to 4 miles outside the shoal water skirting the mainland, the depth ranging uniformly from 5 to 12 fathoms over mud. Farther off shore, the depths increase to 16, 18, and 20 fathoms; the latter being the average depth found close to the inner edge of the barrier reefs.

CAUTION.—The dangers which most require looking out for between the Palm islands and cape Grafton are Eva islet close off cape Sandwich, *see* Caution, page 229; Kennedy shoal; King reefs, and the edge of the shoal water skirting the coast to the northward.

The TIDAL STREAMS run with great strength on both sides of Fitzroy island.

From CAPE GRAFTON to LIZARD ISLAND the Inner route is bounded eastward by Green islet; the inner edges of the barrier on either side of Trinity opening; Satellite rock; the dangerous patches, and inner edges of the reefs extending from abreast of Snapper isle to Hope islands; Endeavour; **b.**; Scott rock; **e.**; and Turtle reefs; Three isles; Two isles; **i** reef and shoal water south-westward of it; Rocky islets and the foul ground to the north-westward; North and South direction; and Lizard islands.*

The route is bounded westward by Double island; the shoal spit south-eastward of Island point; Low islets; Snapper island; cape Tribulation, the mainland from thence to Walker point; Monkhouse point; cape Bedford; Conical rock; Low wooded islet (left eastward by night); cape Flattery; **l.** and **m.** reefs; and Eagle islet.

The greatest breadth is 15 miles, between the reef forming the northern side of Trinity opening, and the white cliffs in Trinity bay; the least breadth is $2\frac{1}{2}$ miles, between Lizard and Eagle islands.

The soundings are generally regular, ranging from 5 to 24 fathoms; the bottom near the reefs is mostly coral; and in other parts, mud and sand.

From LIZARD ISLAND to CAPE MELVILLE the Inner route is bounded to the northward by the inner edges of the barrier reefs north-westward of Lizard island; the Howick group; **s.**, **t.**, and **u.** reefs, and outlying patch of rocks abreast of Barrow point; **w.** reef; Broomfield rock; and the Pipon islets.†

* *See* Admiralty charts of Australia, east coast, sheets XVI. and XVII., Nos. 2,350 and 2,351; scale, $m = 0.25$ of an inch.

† *See* Admiralty chart of Australia, east coast, sheet XVIII., cape Flattery to cape Sidmouth and the Barrier reefs, No. 2,352; scale, $m = 0.25$ of an inch.

It is bounded to the south-westward by **n.** reef; Harrington rock; Cole and Noble islands; Barrow island; and the rocky shoal skirting the coast from North Bay point to cape Melville.

The greatest breadth is about 14 miles, between **n.** reef and Howick group; and the least breadth is $1\frac{1}{2}$ miles, between Howick group and Cole islands.

The soundings are regular, ranging from 5 to 17 fathoms, over mud and coral sand.

CAUTION.—The reported dangers to the westward of **n.** islet; the doubtful Megæra rock, eastward of the Howick group, and the doubtful shoals off Barrow islet should be carefully looked out for.

TIDAL STREAMS.—In the narrows between **w.** reef and the mainland from Barrow point to cape Melville, the tidal streams run with great velocity, for which due allowance must be made; their direction is with the channel, and they are also greatly influenced by the prevailing south-east winds.

CHAPTER V.

CAPE MELVILLE TO CAPE YORK.—GREAT BARRIER REEFS.—
INNER ROUTE.

VARIATION from 5° 45' to 4° 50' EAST, in 1879.
Variation nearly stationary.

BATHURST BAY, immediately on the west side of cape Melville, extends S.W. by W. $\frac{3}{4}$ W. 17 miles to Bathurst head, and is about 5 miles in depth. Its shores consist of sandy beaches and mangroves, until within 6 miles of Bathurst head, then of steep rocky cliffs. Several ridges of wooded hills approach the shore. Bay hill, which separates two wooded valleys, nearly midway between cape Melville and Bathurst head, is 1,273 feet high.*

Channel spit, on which are 2 fathoms water projects W.N.W. $2\frac{1}{4}$ miles from the north-western point of cape Melville; it is steep-to, and may be approached to one-quarter of a mile, in depths of 6 and 8 fathoms.

From Channel spit, a mud-flat, with an average depth of 2 fathoms on it, skirts Bathurst bay, to Bathurst head, extending from 2 to 3 miles from the shore.

Rocky islands, 8 miles to the eastward of Bathurst head, are two in number, both being barren and rocky; the inner islet lies one mile; and the other on the outer edge of the shoal skirting Bathurst bay, $2\frac{1}{2}$ miles from the shore.

Two small knolls, with $3\frac{1}{4}$ fathoms water on them, lie between cape Melville and Rocky islands, and from one to $1\frac{1}{2}$ miles outside the shoal; with these exceptions, the soundings in the bay are very regular, the water gradually deepening with increasing distance from the outer edge of the flat.

Water.—At about 4 miles to the south-westward of cape Melville is a good stream running into Bathurst bay, at which H.M.S. *Bramble* watered in August 1848, when there was a plentiful supply. Great caution is necessary here, as the natives are very hostile and treacherous: they once attacked two of the boats of the *Bramble*; and a strong guard was found necessary to protect the watering party.

* See Admiralty chart of Australia, East coast, Sheet xviii., cape Flattery to cape Sidmouth, and the Barrier reefs, No. 2,352; scale, m = 0·25 of an inch.

BATHURST HEAD is a rugged projection of the mainland to the north-west, it is of moderate height, terminating in three rocky points, with small sandy bays between : these points may be safely approached to half a mile, in from 5 to 9 fathoms water.

FLINDERS GROUP consists of five islands, extending from $1\frac{1}{2}$ to $7\frac{1}{2}$ miles northward from Bathurst head ; they are high and rocky, with a partial covering of stunted trees and scrub, with mangroves near the shore. The northernmost island is 4 miles long, N. by E. and S. by W., and from one-third of a mile to $2\frac{1}{2}$ miles broad. Castle hill, the east extreme of the island, is a remarkable, cliffy head-land, with a notched summit, nearly isolated at high water.

Cape Flinders, the north extreme of the northernmost Flinders island, being a bold head-land, above 300 feet high, is a good mark for vessels passing : this cape and Castle hill may be approached to one quarter of a mile, in from 9 to 12 fathoms water.

The central and largest island of the group, is 3 miles long, East and West, and about 2 miles broad. Flinders peak, its highest part, is a remarkable hill, 829 feet high, near the south-east extreme of the island. This island is well wooded, and may be approached on its eastern and southern sides to about half a mile.

The channel between the central island and that to the north-westward of it is not to be recommended, on account of shoal water, and the strong tide streams in it.

The southernmost island, which is also high and wooded, is 2 miles long, one mile broad, and has a peak near its western end. Its eastern and southern sides are bold and steep-to ; but shoal water extends nearly a mile from its western extreme, and a coral reef, about a quarter of a mile broad, skirts the north side of the island.

The south-western island is about 2 miles long, and three-quarters of a mile broad at its north-east end, where it rises to a peak ; the remaining portion of the island is narrow, and formed by two rocky mounds, connected by narrow necks.

The fifth, and smallest of this group, is merely a small bushy islet, with a rock one quarter of a mile to the westward of it ; both lying about one-third of a mile to the northward of the opening between the two southern islands.

A deep channel, about three-quarters of a mile wide, runs nearly East and West, between the two northern and the three southern islands ; it is clear of all dangers, except a ledge of rocks projecting from the south-east point of the central island, and the islet and rock just mentioned ; but as there appears, at present, to be no object in going through this channel, it would be better to avoid it, as the tide streams are very strong.

There is a clear deep channel, one mile wide, between Flinders group and Bathurst head.

Natives were seen on Flinders group ; but no fresh water having been found, after a careful search, it is not probable that these islands are permanently inhabited.

TIDES.—It is high water, full and change, at Flinders group, at 9h. 15m.; rise from 8 to 12 feet.

Anchorage.—There is good anchorage, in 8 fathoms, to the south-westward of cape Flinders, at about half a mile from the shore ; and also at nearly the same distance from the north-west side of the south-western island. There is anchorage in from 12 to 14 fathoms, at two-thirds of a mile from the shore, on the north-west side of Low Woody island.

LOW WOODY ISLAND, N.E. by E. $\frac{1}{2}$ E. $5\frac{1}{2}$ miles from cape Flinders, is nearly oval, and about $3\frac{1}{2}$ miles in circumference : on its north-west side is a strip of coral reef, with a sand-bank on it ; and shoal water extends about a mile from its south-west end : the north and east sides of the island are steep-to.

a. SHOAL, a small dangerous knoll, on which the boats of the *Bramble* found 2 fathoms water, lies nearly midway between cape Flinders and Low woody island ; there is a deep channel one mile wide, between the shoal and the reef extending from the south-west side of the island, but the broader, and by far the safer channel, lies between **a. shoal** and cape Flinders. This danger lies in line with the east extremes of the central and southern islands of Flinders group, and E. by N. 3 miles from cape Flinders.*

b. REEF, to the northward of Flinders group, is 4 miles long N.E. and S.W., and $1\frac{1}{2}$ miles broad ; it is steep-to on the east and west sides ; but shoal water extends about half a mile from its north-east extreme, and on the south side, $1\frac{1}{2}$ miles West of Clack islet, is a spit of 2 fathoms projecting to the southward about one third of a mile. Trepan is very abundant on the reef.

Clack islet is a flat-topped rock, 60 feet high, on the south-east bend of **b. reef**, and N. by E. $3\frac{1}{4}$ miles from cape Flinders. There are some stunted mangrove bushes on the edge of the reef, to the westward of the islet, and a rock and several small mangrove islets extend along the margin of the reef to its north-east extreme.†

* H.M.S. *Satellite* grounded on this shoal in June 1822, when the least water found on it was stated to be 6 feet. Captain King's Australia. Vol. II. p. 289.

† Under and on the sides of some of the overhanging rocks on Clack islet were rude drawings, coloured in red and white, of turtle, fish, crabs, spears, mushroom coral, and several other things.—Mr. G. H. Inskip, H.M.S. *Bramble*, 1848.

PRINCESS CHARLOTTE BAY is an extensive indentation of the low, flat country comprised between Bathurst head and Claremont point, a distance of 34 miles W. by N. $\frac{3}{4}$ N., and 20 miles in depth. The whole coast of the bay is very low ; the southern portion consists entirely of mangroves, but the western side is a continuous sandy beach, with three low cliffy points.

Between Bathurst head and the bight of Princess Charlotte bay are four creeks ; the two intermediate of which were traced by the boats of the *Bramble*, for 3 miles inland. The entrance of one of these creeks, 10 miles to the south-westward of Bathurst head, carried from one to 3 fathoms water ; and the other $7\frac{1}{2}$ miles farther to the south-westward, from 3 to 7 fathoms, with 6 fathoms at 3 miles above the entrance ; this creek trends to the eastward, in the direction of Jane Table land. All these creeks are blocked up by mud and sand-flats, which skirt the shores of the bay, and extend from 2 to 5 miles off ; the depth then increases to 4 fathoms, outside which the water gradually deepens.

ASPECT.—A low and thickly-wooded country extends a considerable distance inland from Princess Charlotte bay, from which rises abruptly Jane Table land ; the conspicuous flat top of this hill, which is about one mile in extent and 1,000 feet high, lies S. by W. 16 miles from Bathurst head ; except this hill and a conspicuous peak at the southern end of a range of inferior height, extending towards it from Bathurst head, no other high land was seen at the back of the bay. On the western side of Princess Charlotte bay the land is somewhat higher than it is about the bight, and of a more dry and sandy nature. Capt. King observed some hills of moderate height, inland to the westward, which form a range of about 10 miles in extent, but they are not visible more than 10 or 12 miles off.

Cliff islands are small, and three in number, with some rocks, lying S.E. by S. 14 miles from Claremont point, and they derive their name from the cliffy formation of their seaward sides ; the western island is about 50 feet high. The eastern island lies 5 miles off shore, and being just within the edge of the shoal which skirts Princess Charlotte bay, is a good mark for it in that direction. A patch with $3\frac{1}{2}$ fathoms water on it lies 2 miles E. $\frac{1}{4}$ N. from outer Cliff island.

Wilkingen reef, discovered by the master of the schooner *Wilkingen*, in 1873, lies $6\frac{3}{4}$ miles East of outer Cliff island, and in a direct line with the outer extreme of Bathurst head ; it partially dries at low water, and has 7 to 8 fathoms close round it.

CLAREMONT POINT is a low wooded projection of the mainland, having nothing remarkable to distinguish it ; and being skirted by shoal water and coral patches, it is unsafe to approach within $2\frac{1}{2}$ or 3 miles.

c. REEF, to the north-westward of Flinders group, has only been traced on its south-east side for about 16 miles in a general S.W. by W. direction from 10 miles North to 14 miles W. $\frac{3}{4}$ N. of cape Flinders; it appeared steep-to, but some sunken rocks lie close off its south-west extreme.

Beacon.—A square black beacon is placed on the south-west extreme of this reef.

d. REEF, W. $\frac{1}{2}$ S. 13 miles from cape Flinders, is $1\frac{1}{2}$ miles long East and West, and half a mile broad; it uncovers at low water, and has two banks of coral sand and a few mangrove bushes on it; one bank is on its north-east, and the other on its south-west end. The reef may be approached to half a mile on all sides. Turtle are very plentiful in March in the lagoon within the reef.

Beacons.—Two triangular red beacons mark the east end of this reef.

e. REEF, W.N.W. $5\frac{1}{2}$ miles from **d.** reef, is circular, and 2 miles in circumference; it has a small sand-bank on its south-west side, and may be neared on all sides to a distance of half a mile.

Beacon.—A triangular red beacon is placed in the centre of this reef.

f. REEF, W. by N. $3\frac{1}{2}$ miles from **e.** reef, is also circular, and one mile in circumference; it has a small sand-bank and some rocks on it, which dry at low water; this reef is steep-to, like the others; but neither **d.** nor **e.** reefs afford any sheltered anchorage, as they are not of sufficient extent to prevent the swell meeting under their lee.

Beacon.—A triangular red beacon marks the centre of this reef.

g. and h. REEFS, respectively 5 and 10 miles north-westward of the south-west extreme of **c.** reef, are thus described by Captain King:—
 “**g.** and **h.** are two coral reefs, but it was not ascertained whether they
 “are connected with each other or not; they may also be joined to **c.**,
 “and indeed this supposition is very likely to be correct, for we found the
 “water quite smooth, and little or no set of tide on passing them. On the
 “south-west extreme of **g.** reef, 3 miles to the northward of **e.** reef, there
 “is a dry sandy cay, as there is also upon **h.** reef; but on the latter there
 “are also rocks, and the sand is dry for 4 or 5 miles along its north-side.”*
 The south-west edge of **h.** reef lies N. by E. 5 miles from **f.** reef. Both are skirted by sunken rocks, but they do not extend so far off as to prevent a vessel passing at three-quarters of a mile from their edges, where the depth will be from 6 to 10 fathoms.

Beacon.—On the south-west extreme of **g.** reef is a square black beacon.

i. ISLET, N. by W. $\frac{1}{2}$ W. 6 miles from **f.** reef, and E.N.E. 10 miles from Claremont point, is a small patch of sand, with some grass upon it;

* Captain King's *Australia*. Voll. II., p. 291.

it is situated upon the north-west end of a reef nearly 2 miles long North and South, and $1\frac{1}{4}$ miles broad. The reef is covered at high water, but easily seen from the mast-head; it may be safely approached to half a mile, and affords good anchorage in 9 and 10 fathoms, under its lee.

Beacon.—A square black beacon is placed on the west side of the reef.

There are clear deep channels between **b.**, **d.**, **e.**, and **f.** reefs, and also between them and **c.**, **g.**, **h.**, and **i.** reefs, with from 10 to 20 fathoms water.

The COAST from Claremont point trends N. by W. $\frac{1}{4}$ W. 36 miles to cape Sidmouth, and consists of one continuous sandy beach, without any other interruption than Red cliff, 6 miles to the southward of cape Sidmouth. A flat shallow bank, with innumerable coral patches and sand-knolls on it, fronts this portion of the coast, from 2 to 4 miles off.

ASPECT.—The country from Claremont point to cape Sidmouth is flat and well wooded, without any eminence to break its aspect except Round hill and the two high ridges which extend from it to the north-eastward, one terminating at Red cliff and the other at cape Sidmouth, with a wooded valley between them.

Round Hill, so named by Captain King from its appearance seaward, rises to a considerable height between the above two ridges of hills, and bears S.S.W. $\frac{1}{4}$ W. 10 miles from cape Sidmouth; it is distinctly visible in clear weather from the outer edge of the Great Barrier reefs.

Pelican islet, N. $\frac{3}{4}$ W. 3 miles from **i.** islet, and N.E. $\frac{1}{2}$ E., 11 miles from Claremont point, is a mere sand-bank with grass and a few bushes upon it, on the west side of a reef 2 miles long North and South, and $1\frac{1}{4}$ miles broad. The reef is covered at high water, is steep-to, and easily seen. There is very good anchorage in 10 or 12 fathoms, mud and sand, at half a mile from the edge of the reef.

Turtle may be procured on Pelican islet during certain seasons of the year, as they land to deposit their eggs in the sand; it is also frequented by great numbers of birds.

TIDAL STREAMS.—The sets of the tide in the northern part of Princess Charlotte bay are irregular, and require care. Near Claremont group the flood tide sets South, ebb to the N.E.

Caution.—Commander F. C. Robinson, H.M.S. *Pioneer*, in September 1862, experienced between Flinders group and Pelican islet, a strong north-east set during the latter half of a spring flood tide; at another time he experienced an opposite set. Great caution is therefore necessary.

Commander Robinson also reports having found less water between Flinders group and reef **d.** than appears on the chart.

CLAREMONT ISLANDS, five in number, are small, low, and wooded and lie between Claremont point and cape Sidmouth. No. I., W.S.W. $4\frac{1}{2}$ miles from Pelican islet, is $1\frac{1}{2}$ miles in circumference, covered with bushes, and surrounded by a narrow fringe of coral, with a ledge extending 2 cables westward of the island; but it is too small to afford anchorage sheltered from the swell.

Making No. I. island from the south-east it appears as two, the eastern being the largest.*

No. II. is also covered with bushes, and has a few trees growing on it. It is nearly 2 miles in circumference, and lies N.W. by N. $4\frac{1}{4}$ miles from N. I. island; a reef surrounds it, which is steep-to. There is good anchorage in 7 or 8 fathoms, sandy bottom, under the lee of the island, at about a half a mile from the shore.

No. III., N.W. $6\frac{1}{2}$ miles from II. island, is small, wooded, and surrounded by a reef, $3\frac{1}{2}$ miles in circumference, which extends farthest off the south-west end of the island.

No. IV., N. by E. $\frac{3}{4}$ E. $6\frac{1}{2}$ miles from III. island, is of the same aspect as those just described, but has merely a narrow fringe of coral round it.

No. V. is small, low, wooded, and one mile in circumference; it lies N.E. by E. $1\frac{1}{2}$ miles from IV. island, and on the west edge of a reef $2\frac{1}{2}$ miles long N.E. and S.W., and $1\frac{1}{2}$ miles broad; the reef is partly dry at high water.

Anchorage.—There is very good anchorage in from 10 to 15 fathoms at half a mile from the reef, but the island must not be approached too near, as a spit runs out from the north-west side.

l. Reef is long and narrow, its south-west extreme lying N. $\frac{3}{4}$ W. 4 miles from Pelican islet. Captain King describes it as 10 miles long, and from one third of a mile to $1\frac{1}{2}$ miles wide.†

m. REEF extends a considerable distance to the north-eastward, nearly parallel with l. reef, from the north-west side of which it is separated by a channel from one to 2 miles wide, leading towards the Great Barrier reefs. On the west extreme of m. reef is a large sandy cay and some rocks above water N.W. 8 miles from Pelican islet. The south-west end of m. reef is $2\frac{1}{2}$ miles wide; but towards its north-east extreme it narrows to the breadth of one quarter of a mile. The reef covers at high water; but the sandy cay is always dry, and to the northward of it there is good anchorage; but in approaching the reef care must be taken to clear some spits extending about one third of a mile from its south-west end.

Beacon.—A square black beacon marks the west end of m. reef.

* Remark book of Mr. T. H. Hayman, Master H.M.S. *Salamander*, 1864.

† Captain King's *Australia*. Vol. II., p. 292.

n. REEF, which may possibly be connected with **m. reef**, has a small sand-bank on its west end, N. $\frac{1}{2}$ E. 4 miles from the west extreme of **m. reef**.*

o. REEF.—The western end of this reef is about $1\frac{1}{2}$ miles broad; but its extent to the eastward has not been determined. On its west extreme, $6\frac{1}{2}$ miles North of No. 5 Claremont island, is a small dry sand-bank, with a larger one $2\frac{1}{2}$ miles to the eastward of it. The south and west edges of **o. reef** are steep-to.

p. REEF is a small and very dangerous coral patch, E. by S. $\frac{1}{2}$ S. $4\frac{1}{2}$ miles from Red cliff, and S.S.E. $\frac{3}{4}$ E. $8\frac{1}{2}$ miles from cape Sidmouth. It is of a circular form, and not more than 3 cables in diameter, and being covered at all times of tide, and steep-to, the lead gives no warning of approach to it.

No. VI. REEF, extending from 2 to 5 miles northward of **o. reef**, is nearly 4 miles long N.E. by N. and S.W. by S., and one mile broad: masses of sand covered with bushes extend along the north-west side of the reef, under the lee of which is good anchorage, in 10 fathoms, mud and sand, at half a mile from the shore.

At 2 miles to the northward of **VI. reef** is a narrow coral reef with from 3 to 6 fathoms water on it.

Beacon.—On the south-west end of **VI. reef** is a square black beacon.

LIGHT-VESEL.—From a vessel moored in 12 fathoms, westward of the centre of **No. VI. reef**, with the beacon on Heath rocks bearing W. by N. $\frac{1}{2}$ N., $2\frac{1}{2}$ miles, a *fixed* white light is exhibited at an elevation of 85 feet above the sea: it is visible 10 miles in clear weather.

HEATH ROCKS, S.E. by E. $\frac{1}{2}$ E. $5\frac{1}{2}$ miles from cape Sidmouth, and nearly in the centre of the fairway channel, is a dangerous shoal about one mile long, North and South, with a small rocky patch of coral on it, which dries at low water. This shoal is steep-to, and must be passed with caution.

Beacon.—A red triangular beacon is erected on the centre of this shoal.

q. REEF is a small patch of coral rocks, with 2 fathoms on it and deep water round, between Heath rocks and cape Sidmouth; it lies half a mile outside the edge of the shoal water skirting the mainland, and E.S.E. $3\frac{1}{2}$ miles from the cape. The shoal being covered at all times of tide, it

* A small patch, with about 6 feet of water on it, was reported by Mr. Chilcott as lying W. by S. $\frac{1}{2}$ S., $3\frac{1}{2}$ miles from **m. sand-bank**: but H.M. Ships *Rattlesnake* and *Hecate* passed over the position assigned to it without seeing any danger. Commander Nares, H.M.S. *Salamander*, in 1876, also searched for the patch, but without finding it.

invisible until within a short distance of it, a very careful look-out must be kept when passing it.

NO. VII. ISLET, N.E. by E. $\frac{1}{4}$ E. $6\frac{1}{2}$ miles from cape Sidmouth, is merely a small patch of dry sand, lying on the north-west end of a reef 2 miles long N.N.W. $\frac{1}{2}$ W. and S.S.E. $\frac{1}{2}$ E.; the reef is covered at high water, and is steep-to, with good anchorage in from 12 to 15 fathoms, under its lee.

Beacon.—A square black beacon is erected on the western side of No. VII. islet reef.

REEFS.—Mr. F. Blanchard, master of the Claremont island light-ship, reports the existence of a reef lying between Nos. VI. and VII. Claremont islands; it is nearly a mile wide, trending to the north-east, and is dry at low-water springs. Off its western extreme is a detached coral patch, on which there is a depth of 4 feet at low water. It lies with No. VII. island, beacon N.N.W.; Heath rocks, beacon S.W. $\frac{1}{4}$ S.; and No. VI. island, beacon S. by E.

There are also some mushroom coral patches between this rock and the shoal water to the southward. These dangers are out of the fairway of the channel, but vessels working through, should be careful not to stand inside a line drawn between the western edge of No. VI. and VII. reefs.

Nearly 3 miles N.N.W. $\frac{1}{2}$ W. from No. VII. islet is the south extreme of a very narrow coral reef, $1\frac{1}{2}$ miles long, N.N.W. $\frac{1}{2}$ W. and S.S.E. $\frac{1}{2}$ E.; it is steep-to all round.*

Beacon.—A square black beacon is erected on the west side of the reef, a little to the southward of the north extreme; it is in lat. $13^{\circ} 18' 20''$ S.

CAPE SIDMOUTH has two hummocks, 350 feet high, upon it, which, when seen at a distance from the northward or southward look like an island.

TIDES.—It is high water,* full and change, at cape Sidmouth, at 9h. 15m.; springs rise 10 feet.

The COAST northward from cape Sidmouth takes a nearly N. by W. direction for 34 miles to cape Direction; for the first 20 miles it is low near the sea, consisting of a sandy beach, at the back of which the land is well wooded, and the soil apparently good; the coast afterwards becomes higher, and juts out into three points, the first and third of which are red cliffs, and the intermediate, a remarkable round rock.

* See Admiralty chart of Australia, East coast, Sheet xix., cape Sidmouth to cape Grenville and the Barrier reefs, No. 2,353; scale, $m=0.25$ of an inch.

ASPECT.—From Round hill, described at page 271, 10 miles to the southward of cape Sidmouth, a coast range from 1,000 to 1,640 feet high, and 3 to 4 miles in shore, extends nearly to cape Direction. This range is intersected by several deep and well-wooded valleys, trending to the south-westward, the largest of which lies North 2 miles from Round hill; but the most remarkable valley lies 9 miles to the north-westward of cape Sidmouth; the summit of the range immediately on its south side being 1,640 feet high. Two isolated hills, with wooded valleys between, rise behind the three points to the southward of cape Direction; the southern of these—High Round hill, S. by W. $\frac{1}{2}$ W. 13 miles from cape Direction—is 1,543 feet high, and from seaward is easily distinguished from the other heights of this range.

r., s., and t. REEFS are three rocky patches on an extensive shoal projecting N. by E. $5\frac{1}{2}$ miles from cape Sidmouth; r. and t. reefs are on the edge of the shoal, the former N.E. by N. $3\frac{1}{2}$ miles, and the latter North 5 miles from the cape.

This shoal is a continuation of the dangerous shallow bank which fronts the coast between Claremont point and cape Sidmouth, and after receding to within one mile of the shore, at about 7 miles to the north-westward of the cape, skirts the remaining portion of the coast to cape Direction, extending from one to 3 miles from the shore; it contains innumerable coral patches and sand-knolls, but none of them are above water, except Rocky islet, $2\frac{1}{2}$ miles to the southward of cape Direction.

No. VIII. ISLET, nearly N. $\frac{1}{2}$ W. $8\frac{1}{2}$ miles from cape Sidmouth, is small, low, covered with trees, and is fringed by a narrow reef, with a sandy spit extending from its north-west side.

Norman rock, one-third of a mile westward of No. VIII. islet, was discovered by Commander Norman, of H.M. Colonial sloop *Victoria*, in 1862; it is about 30 yards in extent, with only 2 feet on it at low water. This rock is the more dangerous from its lying in a position which passing vessels might choose for anchorage in easterly winds.

CHILCOTT ROCKS are two patches awash at low water, lying in the fair-way, and bearing respectively E. by S. and E. by N. one mile from No. VIII. islet; they lie about one-third of a mile apart, North and South, with 7 fathoms water between them. Both rocks are flat-topped, about 20 to 25 yards in extent, and steep to all round; a small lump of coral, $1\frac{1}{2}$ feet dry, was seen on the southern rock. To avoid these dangers, a vessel should pass to the eastward of them, rather than between them and No. VIII. islet.

Beacon.—On the centre of the north rock is a triangular red beacon.

No. IX. ISLET, N.N.W. $\frac{1}{2}$ W. $3\frac{1}{2}$ miles from No. VIII. islet, and about $1\frac{1}{4}$ miles to the southward of Night island, is small, with stunted trees on it, and surrounded by a narrow fringe of coral, with a sandy spit extending from its western side.

NIGHT ISLAND, the south extreme of which lies N. by W. 13 miles from cape Sidmouth, is $1\frac{1}{2}$ miles long North and South, and about half a mile broad; it is fringed by a narrow reef, which is steep-to, and a ledge covered at high water, runs off N.E. $1\frac{1}{2}$ cables' lengths from the island. The greater portion of the island is covered with mangroves; but near the middle of the western side is a sandy beach, which affords a convenient landing place.

There is a passage between Night island and the mainland, but it is not to be recommended, as the extensive shoals projecting from the shore towards the island contract the channel to less than half a mile in breadth, and cause strong tide streams.

Anchorage.—There is anchorage between the north end of Night island and the mainland, but it is not very good, and difficult of access to a sailing vessel, with the prevailing south-east wind. In making for this anchorage from the southward, care must be taken to give the patch of coral off the north end of the island, a wide berth. H.M.S. *Zebra* grounded upon it, in 1834, by hauling in too quickly.

t t. REEF is a small patch of coral, N.E. $\frac{1}{2}$ E. $2\frac{1}{2}$ miles from the north end of Night island; it dries at low water, and is apparently steep-to all round; but on the east side, the water has not been sounded.

At N.N.E. $3\frac{1}{2}$ miles from the t t. reef is a sand-bank on the northern part of a reef, of which the western edge only has been traced.

Beacon.—A square black beacon marks the west side of t t. reef.

Sykes rock is a small coral patch with only 4 feet on it at low water, discovered by Mr. Sykes, master of the *Hannah Broomfield*, in 1873. From the rock, Round rock bears N.N.W. $\frac{1}{2}$ W., and the highest part of u. reef, North.

u. REEF is one mile long, N. by W. and S. by E. and half a mile broad, with two patches of sand upon its north end, N. by W. $\frac{1}{4}$ W. $6\frac{1}{2}$ miles from the north extreme of Night island; it lies 2 miles East of 1st Red Rocky point, and nearly joins the edge of the shoal bordering the coast; the water is deep close-up to the eastern edge of the reef.

A small reef is marked on the chart as lying about one-third of a mile northward of u. reef, but the position is doubtful. Caution is therefore necessary in this locality.*

* This reef was not observed by Commander G. S. Nares, H.M.S. *Salamander*, in 1867, but he remarked that a patch of reef extends North from the sand-banks on a reef, or else the sand had shifted further south.

V. REEF, which is covered, lies about E. by N. $\frac{1}{2}$ N. $3\frac{1}{2}$ miles from **U.** reef; the only part traced is the western end, which is steep-to; it has some rocks on its south-west extreme.

Beacon.—On the south-west extreme of this reef is a square black beacon.

DUGDALE ROCK, discovered by H.M.S. *Bramble*, in 1848, is a small coral patch with 4 feet water on it. It lies in line with, and nearly midway between **U.** reef and Sherrard islets, and N.E. by E. $\frac{1}{4}$ E. 4 miles from 1st Red Rocky point.*

W. REEF is a small covered patch on the edge of the shallow water skirting the coast; it lies 2 miles N.E. $\frac{1}{2}$ N. of 1st Red Rocky point.

SHERRARD ISLETS, S.S.E. $\frac{3}{4}$ E. 9 miles from cape Direction, are two in number, appearing from the southward like two black rocks; they are situated on the north end of a reef, one mile long North and South, and are visible at the distance of 7 or 8 miles, the western islet has a few bushes and some stunted vegetation upon it; the other is not quite so large, but the bushes on it are higher. The reef is steep-to.

Anchorage.—There is very good anchorage, in 13 fathoms, mud, at above half a mile from the western side of the reef.

No. X. ISLET, a small dry sand-bank, with a few bushes on its centre, lies S.E. by E. $\frac{1}{2}$ E. $3\frac{1}{2}$ miles from cape Direction, and is surrounded by a reef, one mile long, N.N.W. and S.S.E., which is steep-to, with anchorage under its lee.

A chain of five detached reefs extends in a crescent shape from $3\frac{3}{4}$ miles S.E. by E. to 3 miles north-eastward of No. X. islet; on the southernmost is a sand-bank. There appeared to be a clear, deep channel between the reefs and islet.

CAPE DIRECTION is a projecting rocky head-land, at one mile within the extreme of which is a well-defined, steep, round hill, 473 feet high; the cape has a remarkable appearance when seen at a few miles to the southward, from the number of large ant-hills, of a reddish colour, scattered over the side of the hill. A small rock above water lies close off the cape, enclosed by the Lansdown reef, which surrounds the latter and extends 2 miles from the shore: the edge of this shoal is clearly defined by the change in colour of the water, but the depth close outside being more than 14 fathoms, the lead gives no warning in approaching it; it should therefore be passed with due caution.

* This is probably the dangerous shoal said to exist midway between the position of Dugdale rock and **U.** reef, but which was not seen by the boats of the *Rattlesnake*, nor by Lieutenant Chimmo, in the position assigned to it.

The Natives about cape Direction are numerous and hostile; one of them treacherously, and without provocation, speared a seaman of H.M.S. *Bramble*, in 1843, in presence of several armed officers and men; although friendly intercourse had been held with the natives a few minutes before, some of them having come off to the vessel in a canoe.

LLOYD BAY is a deep indentation of the mainland between capes Direction and Weymouth; it is $15\frac{1}{2}$ miles across N.N.W. $\frac{3}{4}$ W. and S.S.E. $\frac{3}{4}$ E., and about 10 miles in depth. Its south shore, for the most part low and thickly wooded, with a hilly bluff in the centre, extends W.S.W. from cape Direction to a considerable opening in the bight of the bay, appearing like the entrance of a river of some size. After crossing the bar, which has 4 feet water on it, the boats of the *Rattlesnake*, found depths of 7 fathoms, at half a mile within the entrance.

From this opening, the western shore of Lloyd bay trends to the northward, along the base of a coast range of moderate elevation, terminating in the Red hills, which are 496 feet high, and lie close behind a prominent point, $4\frac{1}{2}$ miles to the southward of cape Weymouth: at the back of this range, is an extensive tract of low, wooded land, which opens towards the sea by a valley between Red hills and the cape.

The southern and western shores of Lloyd bay as far up as Lloyd islands, are skirted by shallow flats, extending from one to $2\frac{3}{4}$ miles off.

Lloyd islands are small, rocky, and four in number, extending from $1\frac{1}{2}$ to 3 miles from the western side of Lloyd bay. The largest is high, and lies on a spit of the shoal skirting the bay, W.N.W. $9\frac{1}{2}$ miles from cape Direction. Between Lloyd islands and cape Weymouth the coast may be approached to about one mile, in 6 or 7 fathoms water.

X. REEFS lie about $4\frac{1}{2}$ miles N.W. of cape Direction; the outer, which is covered, is $2\frac{1}{2}$ miles in circumference; the other, one mile to the westward of it, has a sand-bank which dries at low water. There is a cluster of small detached covered reefs, with deep water between, nearly one mile farther to the northward.

Jackson and **Pinacle rocks** are two rocky patches in the south part of Lloyd bay; the former, covered at low water, is $1\frac{1}{2}$ miles South of the eastern **x.** reef, and 4 miles W.N.W. from cape Direction.

Pinacle rock is $2\frac{3}{4}$ miles W. $\frac{1}{2}$ S. from Jackson rock; from it the high Lloyd island is just open eastward of Low island, and the west point of Hilly bluff bears S. by E. $2\frac{1}{2}$ miles distant.

Edwards rock, in the north part of Lloyd bay, is nearly awash at low water, with 8 fathoms close to; it is a patch of rocks nearly half a mile long, East and West, and about 100 yards wide. From the centre of the patch, the high rock off Restoration island bears N. by E., and the peak of Red hills S.W. $\frac{1}{4}$ W.

The general depth of water between and about the Jackson and Pinnacle rocks, and in the south part of the bay, is from 4 to 5 fathoms; in the northern portion the water is deeper, shoaling gradually from 9 to 5 or 6 fathoms, close up to the edge of the reef which skirts the shore. The bottom is generally muddy.

y. REEF, N. E. $\frac{3}{4}$ E. 4 miles from cape Direction, is about one mile in circumference; it is steep-to and covered at high water, but is easily seen from the mast-head.

Beacon.—A square black beacon is placed on the centre of this reef.

z. REEF is a coral patch about the same size as **y.** reef, from which it bears N. by W. $2\frac{1}{2}$ miles: there is a sand-bank on its north-western extreme, and some sunken rocks lie about half a mile to the eastward of it.

a. REEF, which has a patch of dry sand on its north-west end, N. $\frac{1}{2}$ E. 9 miles from cape Direction, is covered at high water, and extends a considerable distance to the eastward. A spit of shoal water extends nearly a mile off the south-east end of this reef.

b. REEF, N.W. by N. 5 miles from **a.** reef, extends some distance to the eastward, like **a.** reef, but it has no sand-bank upon it; the western edge, 6 miles to the eastward of cape Weymouth, is steep-to; the remaining portion of the reef was not examined, although numerous reefs, with narrow channels between, were seen extending to the eastward.

CAROLINE ROCK, nearly awash, lies W. $\frac{1}{2}$ S. 2 miles from the south end of **b.** reef, and $3\frac{3}{4}$ miles E. by S. $\frac{1}{2}$ S. from the high rock off Restoration island; there is deep water close outside this rock, but the passage between it and the reef has not been closely examined.

CAPE WEYMOUTH is a barren, stony projection of moderate elevation, sloping down from a high hill a little inland; the country behind is low, and apparently well wooded, for several miles.

RESTORATION ISLAND, half a mile to the eastward of cape Weymouth, is small, conical, and 466 feet high; it is steep-to on its eastern side; but a sandy spit extends a short distance from the western side, and a small low rock lies about one-quarter of a mile off the south point. This island, like cape Weymouth, is rocky, with a few stunted trees growing on it. There is no passage between Restoration island and the mainland, except for boats.*

At about three-quarters of a mile outside the eastern point of Restoration island, is a rock 136 feet high, with deep water round it.

* Captain Bligh first landed on this island after his perilous voyage across the Pacific ocean in the boat of the *Bounty*.

WEYMOUTH BAY is a slight indentation of the coast between cape Weymouth and Fair cape, a distance of nearly 16 miles N.W. $\frac{1}{4}$ N. From cape Weymouth the coast trends north-westward, 13 miles, to the entrance of Pascoe river, and consists of alternate points and bays, fronted by sand and mud-flats, and backed by a range of barren and stony hills, rising to a height of 1,264 feet. Behind these the low level country extends northward to the river entrance.

Immediately to the northward of the river, a range of barren rocky hills trends from S.W. to N.E., terminating at a point $1\frac{1}{2}$ miles to the southward of Fair cape; the summit of this range is 2,342 feet high.

The shores of Weymouth bay are skirted by shallow flats, extending from a quarter of a mile to $1\frac{1}{2}$ miles from the land; there are two small islets near the shore, Rocky islet, 2 miles to the north-westward of cape Weymouth, and Pigeon islet, $1\frac{1}{2}$ miles to the south-eastward of the mouth of the river.

The soundings outside the shoal water are irregular, increasing off-shore, from 6 to 12 fathoms, with muddy bottom.

Pascoe river enters Weymouth bay 5 miles southward of Fair cape; shallow sand banks block up the entrance, but 3 miles inside where the river is 100 yards broad, and 12 feet deep, the water is fresh; $4\frac{1}{2}$ miles further up the river narrows to 50 yards.

On the northern or left bank of this river, the expedition under the late Mr. Kennedy, when exploring the country from Rockingham bay to cape York, encamped for the last time.

The Natives of Weymouth bay are numerous, and their canoes are fitted with outriggers on both sides, being the first of that description seen when coming from the southward. They are not to be trusted in the neighbourhood of Pascoe river.

c. REEF, N.E. by E. $4\frac{1}{2}$ miles from Restoration island, is about 2 miles in circumference, with a small sandy islet on its north-west end, under the lee of which is good anchorage, in 20 fathoms, mud and sand, at about half a mile from the reef. A cluster of small detached patches extends about a mile to the south-eastward of c. reef, and two others lie 3 miles to the eastward of it.

d. Reef, $2\frac{1}{2}$ miles to the northward of c. reef, is a patch of coral about one mile long; the soundings upon it are very irregular, and the least depth of water found was $2\frac{1}{2}$ fathoms. It is easily seen at a distance of 2 miles.

e. REEF, the south extreme of which lies $1\frac{1}{2}$ miles to the northward of d. reef, is an extensive field of coral, the south and south-west limits of which only have been traced; the edge bordering the Inner route extends

from $6\frac{1}{2}$ miles N.N.E. of cape Weymouth north-westward to E. by N. 6 miles from Fair cape, a distance of 10 miles, where it terminates in a narrow point, with a small spit of dry sand and some rocks upon it; with this exception, the reef is entirely covered at high water, but its inner edge is steep-to, so that a vessel may safely run along it at a distance of half a mile.

Beacon.—The north-west end of Θ . reef has a square black beacon on it.

f. Reef is a small circular patch lying between the eastern side of Θ . reef and Quoin island; there is also another similar patch about $1\frac{1}{2}$ miles to the south-eastward of it. The eastern side of Θ . reef has not yet been traced out.

Quoin Island, so named from its shape, lies $6\frac{1}{2}$ miles E. $\frac{1}{2}$ N. of the north-west extreme of Θ . reef.

MIDDLE REEF, so called from being nearly in mid-channel, between the mainland and Θ . reef, is a very low, narrow strip of coral, with three scattered bushes, lying about N.W. by N. 6 miles from Restoration island. It is $1\frac{1}{2}$ miles long, and about a quarter of a mile broad; there is a bush on its south-east end, and on its north-west extreme is a dry sand-bank, with a shallow spit extending about one-third of a mile to the northward; with this exception, Middle reef has deep water close to on either side.

Beacon.—A triangular red beacon is erected on the south end of Middle reef.

Blue Bell rocks, two in number, are detached, with deep water between, occupying a space of half a mile long, North and South; the north rock has 3 feet on it at low water, and is easily seen from the mast-head; it lies about $1\frac{1}{2}$ miles S.W. $\frac{3}{4}$ W. from the north patch of sand on Middle reef. The south rock has 9 feet on it and can only be indistinctly seen.

There is deep water between these rocks and Middle reef.

Current.—A strong current generally sets to the north-westward through the channel off Weymouth bay.

FAIR CAPE is a rocky promontory, N.W. 16 miles from cape Weymouth, and is backed by barren, stony hills, which rise to the height of 1,566 feet; on the side of the hill, at about a mile to the north-westward of the cape, is a remarkable patch of sand, visible 6 or 8 miles off.

KANGAROO SHOALS are dangerous banks, chiefly of sand, extending 2 miles to the north-eastward, and nearly 3 miles to the northward from Fair cape, of which the lead gives no warning, as the depth outside suddenly decreases from 9 to $1\frac{1}{2}$ fathoms.

TEMPLE BAY, between Fair cape and cape Grenville, a distance of 26 miles N. by W., is about 11 miles in depth. The south shore consists of alternate rocky points and shallow bays, taking a westerly direction for 12 miles from Fair cape to the bight of the bay, where a creek intersects the low land, in a southerly direction. A coast range of stony hills extends 8 miles to the westward from Fair cape, the most elevated summit being 1,570 feet high.

The western shore, from the bight of Temple bay to cape Grenville, has few irregularities; the southern portion is backed by a range of considerable elevation, as far as Bolt head, 5 miles from the bight, which head terminates the high hills from the southward. At 2 miles to the northward of Bolt head is a remarkable red cliff, from whence partially-wooded sand-hills extend nearly all the remaining distance to cape Grenville.

From Kangaroo shoals the shores of Temple bay are bordered by shallow sand and mud-flats, extending from half a mile to $2\frac{1}{2}$ miles from the land, projecting farthest from the bight of the bay.

1., 2., and 3. Reefs are small covered coral patches, lying respectively from one to 3 miles off the south shore of Temple bay, and **4, 7, and 10 $\frac{1}{2}$ miles** from Fair cape.

4. and 5. Reefs are somewhat larger than those last mentioned, and each has a small patch of dry sand on its north-west extreme. **4. reef** lies $2\frac{1}{2}$ miles to the north-eastward of Bolt head; and **5. reef**, near the edge of the shoal bordering the shore, N.N.E. $3\frac{1}{2}$ miles from the remarkable red cliff.

g. REEF, a large coral field, the south-west edge of which only has been traced, extends north-westward 11 miles, from 3 miles eastward of the north-west spit of **e. reef**, to a dry sand-bank N. by E. $\frac{1}{2}$ E. 10 miles from Fair cape; with the exception of this sand-bank, the whole of **g. reef** is covered at high water. Its south-west edge is steep-to, but a detached coral patch with 5 feet on it lies from one-third to half a mile off it, with the westernmost Forbes islet bearing N. by E.

Forbes Islets, situated on **g. reef**, are high and rocky; but appeared to be clothed with vegetation. Forbes peak, the summit of the highest islet, bears N.E. distant $10\frac{3}{4}$ miles from Fair cape, and, like Quoin islet, is a conspicuous mark for fixing a vessel's position.

PIPER ISLANDS form a small woody group, in Temple bay, lying on two coral reefs, nearly East and West from each other, and separated by a channel half a mile wide. On the western side of the eastern and larger reef, are four small islets, in line nearly S.E. and N.W.; the north-westernmost, which is the largest, and most central of the group, lies N.N.W. 10 miles from Fair cape. There is a single low mangrove on the south-east extreme of the reef; it is covered at high-water springs.

The western reef, which is $1\frac{1}{2}$ miles in circumference, has a small bushy islet on its south-east edge, and a sand-bank on its north-west extreme.

Anchorage.—There is very good anchorage in 10 to 12 fathoms, mud, under the lee of these reefs, at about half a mile off.

It is worthy of remark that, during the summer season, immense flights of Torres strait pigeons cross over from the mainland to these, and most of the other uninhabited islands to the northward, for the purposes of laying their eggs; they are large fleshy birds, and easily shot.

Beacon.—A triangular red beacon marks the east elbow of the eastern reef.

h. REEF, E. $\frac{1}{2}$ S. 3 miles from the southernmost Piper islet, is narrow, and $1\frac{1}{2}$ miles long, with some dry rocks and bushes on its south-east end; on the north-west extreme is a small sand-bank. The remaining portion of the reef is covered at high water, and its edges are steep-to.

Beacon.—A square black beacon is erected on the south end of **h.** reef.

i. REEF lies immediately to the north-westward of **h.** reef, from which it is separated by a deep channel half a mile wide; this reef resembles **h.** reef in size and character. It has a dry sand-bank on its north-west extreme, bearing E. by N. $2\frac{1}{2}$ miles from the central Piper islet, and masses of rocks above water along its south-western edge. The greater part of **i.** reef, also, is covered at high tide, and its edges are steep-to.

k. REEF, which has a small islet, with a few bushes on its north-western extreme, bearing N.E. $\frac{1}{4}$ E. $2\frac{1}{2}$ miles from the central Piper islet, is 2 miles long E.S.E. and W.N.W., and three-quarters of a mile broad; a spit runs out half a mile to the north-westward from the sand-bank; but every other part of the reef is steep-to.

h., **i.**, **k.** reefs, and that of the eastern Piper islands, are all separated from each other by clear, deep channels from half a mile to one mile broad.

LIGHT-VESSEL.—From a light-vessel coloured red, moored in 13 fathoms, between the Piper islands and **k.** reef, a *fixed* white dioptric light is exhibited at an elevation of 35 feet above the sea, and is visible in clear weather at a distance of 11 miles. From the light-vessel, North Piper island bears W. by S. $\frac{3}{4}$ S., and **k.** islet N. $\frac{3}{4}$ E.

l. REEF, $4\frac{1}{2}$ miles to the northward of **k.** reef, is 2 miles long E.S.E. and W.N.W., and three-quarters of a mile broad; there is a patch of dry rocks on its eastern end, and a sand-bank dries on its western extreme, bearing N. $\frac{1}{4}$ W. $4\frac{1}{2}$ miles from **k.** islet. The greater portion of this reef is covered at high water, and its edges appear to be steep-to, except near its

east extreme and northern side, where there are spits with 2 and 3 fathoms water.

m. REEF, one mile to the northward of **l.** reef, is $2\frac{1}{2}$ miles long S.S.E. and N.N.W., and one mile broad; on its southern end is a mass of rocks, covered at high tide, and on the northern extreme, a dry sand-bank, bearing S. by E. $\frac{1}{4}$ E. nearly 7 miles from cape Grenville. As several shoal spits extend from a quarter to one-third of a mile off this reef, which with the exception of the sand-bank, is covered at high water, a vessel should pass it cautiously.

Beacon.—A square black beacon is placed on the west side of **m.** reef.

YOUNG ISLET is a very small patch of coral S.W. $\frac{1}{2}$ S. $3\frac{1}{2}$ miles from the sand-bank on the northern extreme of **m.** reef; it covers at high water, and cannot be seen until close-to. When first discovered by Captain King, in 1819, there were two small trees upon it; in 1839, there was only one small mangrove tree on its highest part; in 1841, no trees whatever were seen; and in 1848, during Captain Owen Stanley's survey, there was not even a bush upon the islet, nor was there any seen by Captain Richards in 1863.*

* A small patch of coral awash, lies one mile south-east of Young islet.

Beacon.—A triangular red beacon is erected on the north-west side of Young islet.

Current.—A strong north-westerly current generally sets through this part of the Inner route. Sailing vessels should keep well to windward, when past **m.** reef, proceeding for Home islands.

n., o., and p. Reefs, to the north-eastward of those just described, and which nearly join—or are probably one reef—have not been traced, except on their western side. The north-west end of **n.** reef forms a sharp elbow 2 miles to the eastward of **m.** sand-bank, with a narrow passage or opening one mile to the north-eastward of it. From this angle the western edges of the reefs extend S.E. by S. $4\frac{1}{2}$ miles, and N.N.E. $\frac{1}{2}$ E. 6 miles. The south-west edge, which is nearly straight, is steep-to, and may be passed at the distance of a mile off; but the north-west side of **o.** reef, not having been closely examined, should be passed with greater caution. **p.** reef is a circular patch nearly 3 miles in circumference, lying about $5\frac{1}{4}$ miles eastward of the western edge of **o.** reef; there is another patch $1\frac{1}{2}$ miles northward of it, but the position is doubtful.

* These minute details would appear unnecessary, but for the following remarks from Captain King, who, in describing this islet as "a small rocky shoal, on which were two small trees," adds,—“This particular is recorded, as it may be interesting at some future time, to watch the progress of this islet, which is now in an infant state; it was named on the occasion Young island.”—Captain King's *Australia*. Vol. I., p. 236.

HAGGERSTONE ISLAND, S.E. 5 miles from cape Grenville, is 500 feet high, and situated on the south end of a reef, 2 miles long and three-quarters of a mile broad : there are a few trees on the western side, but the remaining portion of the island is covered with large stones, and has a barren appearance ; two patches of dry sand and some rocks lie on the north extreme of the reef, which covers at high water, and appears to be steep-to.

There is a passage $1\frac{1}{4}$ miles wide, between Haggerstone island and **O.** reef ; but Captain King says :—"There is a small reef detached from the north-west end of **n.** reef, which should be avoided, although there is probably sufficient depth of water over it for any ship ; it was seen from the summit of the island, from whence another coral patch was observed at about a mile to the westward."*

CAPE GRENVILLE is a projecting rocky point of moderate elevation connected with the mainland by a curved sandy neck, which forms Indian bay on its southern side ; but the bay is too shallow and exposed to deserve farther notice.

TIDES.—It is high-water, full and change, on the coast between cape Sidmouth and cape Grenville, at 9h. 15m., springs rise 10 feet.

HOME ISLANDS, close off cape Grenville, are seven in number, small, rocky, and mostly covered with wood ; the south-westernmost island lies South $1\frac{1}{4}$ miles ; the easternmost, East $2\frac{1}{4}$ miles, and the north-easternmost, N.E. $1\frac{1}{4}$ miles from the extremity of the cape.

The larger of the two southernmost islands is about three-quarters of a mile long S.E. and N.W., and has a peak on each end.

The central and largest island is about $1\frac{1}{4}$ miles long, S.E. and N.W., and has a rock above water close off its south-east point.

The two north-easternmost islands are moderately high, rising to well-defined peaks.

The other two islands of this group are merely rocks ; one at half a mile, and the other one mile, off the extreme of cape Grenville. From the outer rock a narrow reef extends about three-quarters of a mile to the south-eastward, between which and the central island is a deep channel not more than 2 cables broad. A similar reef extends from one quarter of a mile to $1\frac{1}{4}$ miles to the north-westward from the eastern islet, running nearly parallel with the former reef, and between them is another narrow passage, with 12 and 14 fathoms water ; but neither passage can be considered safe.

The numerous reefs and coral patches with which these islands are

* Captain King's Australia. Vol. II., 299.

enclosed, together with the rapid streams, render the channels between them intricate and dangerous.

The channel between the Home group and Haggerstone island is about 2 miles wide, and clear of dangers; but care must be taken, when rounding the Home islands, to make due allowance for a strong current, which sets to the N.N.W. with a degree of velocity depending, in great measure, upon the prevailing winds at the time.

The Natives are numerous about cape Grenville and the Home islands and are so hostile and daring, that they once came off in six canoes to attack a wooding party of the *Bramble*, on the easternmost islet, in the presence of, and at a short distance from the vessel.

SIR CHARLES HARDY ISLANDS are two in number, the peak of the north one being 13 miles E.N.E. from cape Grenville, they are fringed with narrow coral reefs, which are steep-to; the south-eastern island is $2\frac{1}{2}$ miles in circumference, and of moderate height. The north-western island is not quite so large as the other, but it is higher and more peaked, its summit being 320 feet high; a shoal spit runs out half a mile from its north-west side. Both islands are covered with coarse grass and stunted bushes, growing on a stony soil, which when seen from seaward have a reddish appearance, and being distinctly visible from the Great Barrier reefs, are good marks to steer for, when running for the Inner route. There is a deep channel one quarter of a mile wide, between the islands.*

At nearly S.W. by S. $3\frac{1}{2}$ miles from the north-western Sir Charles Hardy island, are some coral patches, on one of which were the remains of a wreck in 1843. Another coral patch, surrounded by deep water, lies E.S.E. $4\frac{1}{2}$ miles from the south-eastern island.

Water.—The south-eastern Sir Charles Hardy island has the advantage of possessing a very fair spring of fresh water, close to the shore, on the south-west extreme of the island, at two-thirds of a mile off which is small rocky islet. The supply from March to July would be quite sufficient for a large ship; but afterwards the spring appears to dry up, in which case it would be better to proceed to cape York for water, where it can be procured at all seasons of the year.

Anchorage.—The best anchorage is near the north-west side of the south-eastern island; but a vessel may anchor in 6 fathoms, almost anywhere under the lee of the islands.

TIDES.—It is high water, full and change, at Sir Charles Hardy islands, at 9h. 15m.; springs rise 10 feet.

* See Admiralty chart of Australia: East coast, Sheet xx, cape Grenville to Booby island, and the Barrier reefs, with Raine island entrance and view, No. 2,354; scale, $m = 0.25$ of an inch.

Q. REEF is a coral patch, with a small sand-bank on it, W.S.W. 6 miles from the north-western Sir Charles Hardy island; from this and the coral patches, already described, to the south-westward of the isle, a long bank of foul ground, with numerous patches of coral and sand upon it, extends nearly 7 miles to the north-eastward, and terminates at N. by E. $2\frac{1}{2}$ miles from the north-western Sir Charles Hardy island, where the end of the reef is nearly one mile wide. At about $2\frac{1}{2}$ miles to the eastward of the extremity of this shoal are two small patches with 4 and 5 fathoms water on them.

COCKBURN REEF and ISLANDS.—The former is an extensive coral field, the north-eastern point of which has several sand-banks on it that dry at low water, and lies N. $\frac{3}{4}$ E. $5\frac{1}{2}$ miles from the north-western Sir Charles Hardy island; a very narrow part of the reef, intersected by numerous boat passages, thence extends about $1\frac{1}{2}$ miles southward, and then $7\frac{1}{2}$ miles south-westward to the south-east end of the main body of Cockburn reef, which from this, to its north-west extreme is nearly 11 miles long, and 4 miles in extreme breadth tapering to a narrow point.

A spit of sand, with 3 fathoms water on it, projects to the northward about one quarter of a mile from the north-west extreme of the reef. Great caution should be exercised in passing it.

The south and south-eastern edge of Cockburn reef is steep-to, with the exception of a small one fathom patch about two-thirds of a mile off the south point; the eastern and western sides have not been closely examined, they appear to be steep-to, and are easily distinguished.

There is a small sand-bank with bushes on the western side of Cockburn reef, to the south-westward of the Cockburn islands, and at $3\frac{1}{2}$ miles to the northward of it is a small detached coral patch, with a sand-bank on it, close to the edge of the reef. Another very small patch lies nearly midway between the two sand-banks, about half a mile off the reef.

A shoal bordering on the Inner route, the position of which is doubtful, has been reported to exist at about $2\frac{1}{2}$ miles to the south-westward of the above northern sand-bank, and W. $\frac{1}{4}$ N. 5 miles from the northernmost Cockburn island.*

Numerous sunken coral patches lie scattered from 4 miles north-westward of the eastern point, to 4 miles N.N.E. of the north-western point of Cockburn reef.

Three other dangers lie off the north-west extreme of Cockburn reef, a small 9-foot patch at one mile, and a sand-bank at 2 miles to the north-westward, and a rock awash at low water, $2\frac{1}{2}$ miles to the westward.

* Lieutenant Chimmo, who searched for this reef, reports that there were no signs of its existence.

Cockburn islands are four square, rocky lumps, the two northern of which are wooded, lying near the centre of the main body of Cockburn reef; the largest, 300 feet high, bears N.N.E. $8\frac{1}{2}$ miles from cape Grenville; the other three islets lie about a mile to the south-westward of the largest.

POLLARD CHANNEL is a safe though narrow passage, running 9 miles, nearly N.E. and S.W. between the south-east edge of Cockburn reef and the long bank of foul ground to the north-westward of Sir Charles Hardy islands; the average breadth of the channel is about one mile, and the depth varies from 16 to 30 fathoms, with sand and coral bottom. At springs, the streams run through with great velocity, and when opposed to strong breezes, create so confused a sea, as would at times place a vessel in difficulties.

DIRECTIONS.—In sailing through Pollard channel from the eastward, the south-eastern edge of Cockburn reef being, as before observed, quite steep close to, should be skirted at a not greater distance than one-third of a mile, to avoid a series of sandy shoals on the southern side, which, if the weather be fine, will be plainly shown by the difference in the colour of the water; these shoals contract the western end, and narrowest part of the channel, to three-quarters of a mile in breadth.

When the north-western Sir Charles Hardy island bears E. by N. $\frac{1}{4}$ N., well open of the south-eastern island, and the largest Cockburn island N.W. by N., the dangers of Pollard Channel, in running to the westward will be cleared; haul up gradually W. by S., taking care to avoid the shoal patch to the southward of Cockburn reef, already mentioned, after passing which, continue on the same course for nearly 4 miles, then steer for the Bird islands, and proceed as directed at page 401.

A vessel proceeding from Sir Charles Hardy islands to Torres strait, would find Pollard channel most convenient. To enter it from these islands she would have to steer about N.E. by N. for 3 or 4 miles, so as to clear the easternmost point of the long bank of foul ground to the northward of the islands. A much shorter cut may be found, between the numerous coral patches already described to the south-westward of Sir Charles Hardy islands; but as this part has not been closely sounded, the risk is greater, and consequently more caution is necessary.

NORTH CHANNEL, which runs between the eastern and north-west extremes of Cockburn reef, and the scattered sunken patches to the northward, is somewhat shorter and more frequented than Pollard channel.

DIRECTIONS.—A vessel proceeding through the north channel from the eastward, should pass at about three-quarters of a mile to the

northward of the north-east point of Cockburn reef, steering W. $\frac{1}{2}$ S., with Cockburn islands on the port bow. When Sir Charles Hardy islands are in line, S.E. $\frac{3}{4}$ S., steer W. by N. $\frac{1}{4}$ N., and round the spit of the north-west extreme of Cockburn reef—which is clearly defined by the colour of the water,—at the distance of nearly half a mile, then steer to the south-westward for about 2 or 3 miles, to avoid the rock awash, described in page 287, as lying $2\frac{1}{4}$ miles to the westward of the extremity of the reef; the dangers of this channel being then passed, and the Bird islands in sight to the westward, steer for them, and proceed as directed at page 401.

A better route is, after reaching the north-west extreme of Cockburn reef, to steer to the northward and north-westward, passing about one mile eastward of the patches off the extreme, and t. reef, hauling to the westward when the vegetated sand-bank on the latter reef, which is a good mark, bears S. $\frac{1}{2}$ E.*

It will not be necessary to follow to the letter, these directions for the North channel, as there is room enough for the navigator to proceed according to his own discretion, when looking at the chart, taking especial care to keep a good look out for the northern patches, and the dangers off the north-west extreme of Cockburn reef.

Margaret Bay is about 5 miles broad from the north point of cape Grenville, W.N.W. to Thorpe point; an opening in the bight, is apparently the outlet of a small stream. This bay can only afford sheltered anchorage to vessels of very light draught, as the depth of water does not exceed 2 fathoms. The shoal water commences $1\frac{3}{4}$ miles E.N.E. of the north point of the peninsula forming cape Grenville, extending right along it and across the bay; there is deep water close up to the edge of the eastern part of this shoal.

Sunday Islet, which is small and rocky, with a flat summit 250 feet high, lies off Margaret bay, at about $1\frac{1}{4}$ miles N.W. by N. of the north extreme of cape Grenville; there is anchorage in 12 or 13 fathoms, mud, at about half a mile to the north-westward of it, but the islet is not of sufficient extent to prevent the swell meeting under its lee, which comes round the Home islands when there is much wind from the S.E., and causes a ship to roll considerably when tide-rode to the ebb.

Thorpe point is only remarkable for two conspicuous sand-hills at the back of it, which are visible seaward, at a distance of 15 or 18 miles.

The COAST.—From Thorpe point a low shore skirted by a narrow shoal, with several islets on it, trends north-westward 3 miles to Round point, half a mile off which is Rodney islet; the coast then sweeps round

* Commander G. S. Nares, H.M.S. *Salamander*, 1867.

westward to Red cliffs, which bear W. by N. $\frac{1}{4}$ N. 14 miles from Round point, and are surmounted by a remarkable isolated hill.

From the Red cliffs the coast trends N. $\frac{1}{4}$ W. $26\frac{1}{2}$ miles, in a direct line to False Orfordness, and consists of low shores and rocky points, with a coast range of sand-hills, and a barren country behind it.

This part of the coast is bordered by shoal water, running off from three-quarters of a mile to 2 miles from the shore, with an average depth of 7 fathoms close outside, the deepest water being to the northward. There is a coral patch, with a sand-bank, on the edge of the shoal, N.E. by N. 3 miles from Red cliffs; close outside this reef are several coral patches extending to the eastward, almost filling up the passage between the western Macarthur reef and the land. Two rocky patches lie close to the shore, one at nearly 8 miles, and the other 11 miles to the southward of False Orfordness.

A small detached patch, with 3 feet on it at low water, lies outside the shoal fronting the coast, 8 miles to the southward of False Orfordness.*

Shelburne Bay is formed by a slight indentation of the mainland between Round point and Red cliffs. The shores are low and backed by conspicuous sand-hills, and 10 to 12 miles inland are the high mountains known as Richardson range, extending to the northward and southward for some distance. This bay has not been closely surveyed, as it appears to present few advantages worthy of particular examination. Shoal water extends from one to $2\frac{1}{2}$ miles off shore, and several coral reefs and patches lie from one to 4 miles from the land; this bay should, therefore, be avoided.

t. REEF, N.W. by W. $\frac{1}{4}$ W. $4\frac{1}{2}$ miles from the north-west point of Cockburn reef, and which dries at low water, is about 5 miles in circumference, with a vegetated sand-bank on its north-west extreme.

BIRD ISLANDS are a low wooded group, situated on two coral reefs, which are separated by a deep channel, barely one quarter of a mile wide. On the north end of the southern reef is a rock, and on the other end a low islet.

The northern reef is larger than the other, and has three low bushy islets on it; the largest of which lies on the eastern side of the reef, and bears N. $\frac{3}{4}$ W. $7\frac{1}{2}$ miles from Round point.

* Mr. Hunter, of the cutter *Pearl Hunter*, reports the existence of a reef about three quarters of a mile in length, North and South, with its north point in the following position:—False Orfordness, N. $\frac{3}{4}$ W.; North Boydong cays, E. $\frac{1}{4}$ N. He found 8 fathoms of water close to its outer side, and 6, 5, and $4\frac{1}{2}$ fathoms extending from it towards the shore. Though out of the track of steamships, and sailing vessels having a fair wind, it is a danger when working through that portion of the passage.

Anchorage.—Both reefs are steep-to, and there is good anchorage in 10 fathoms, mud, under the lee of the northern, at half a mile from the reef. This has generally been a favourite anchorage for vessels to push for after entering the Great Barrier reefs, if they get through early in the day, so as to reach the Bird islands before dark.

MACARTHUR ISLETS are low, bushy groups, on two coral reefs, separated by an unexamined channel one mile broad. The southern, and larger reef, nearly 6 miles to the westward of Bird islands, is 2 miles long S.E. and N.W., and its edges appear to be steep-to: on the east end is a small sand-bank, which dries at low water springs. The channel between these and Bird islands is clear, with from 9 to 12 fathoms water.

HANNIBAL ISLETS are low, and two in number, on the northern part of a reef nearly $1\frac{1}{2}$ miles long S.E. and N.W., and lie N.N.W. $\frac{1}{2}$ W. $8\frac{1}{2}$ miles from the north-eastern Macarthur islet; both are covered with trees, those on the western and larger islet being the highest. The reef is steep-to on its eastern side.

At about one mile to the westward of the western islet is a remarkable bush, on a small patch of coral, and at a short distance to the northward is a small bank, the position of which is doubtful.

It has been reported by Mr. Simpson, late commanding the brig *Freak*, that a small reef, on which that vessel struck, lies nearly N.N.W. 2 miles from the above small bank, but its position is doubtful.*

A detached reef lies $3\frac{1}{2}$ miles S. $\frac{1}{2}$ W. of the western Hannibal islets, at about 2 miles from the shore, with deep water inside it.

V. REEF, 3 miles to the eastward of Hannibal islets, is about $1\frac{1}{2}$ miles long S.E. and N.W., with a small sand-bank at each end, dry at low water.

Beacon.—A square black beacon is erected on the north-west end of V. reef.

W. REEF, which is 3 miles long E.S.E. and W.N.W., and 2 miles broad, is entirely covered at high water; it is steep-to, and separated from V. reef by a deep channel, one mile broad.

BOYDONG CAYS are three low islets, with trees on them, situated on the north-west ends of three separate reefs; the two south-westernmost reefs are together, 6 miles in circumference, but are separated by a very narrow channel, running N.N.W. and S.S.E. The largest islet, about one mile in circumference, is situated on the south-westernmost reef,

* Lieutenant W. Chimmo, R.N., reports having passed close to the assigned position of the former, and over that of the latter of the dangers, but could not discover either, although it is more than probable the *Freak* struck upon some rock in the immediate vicinity.

and lies $3\frac{1}{2}$ miles to the northward of W. reef. In 1848 there were on this cay several native huts laid out with a considerable amount of system to keep them separate and protect them from the wind ; also a canoe with a raised wicker platform.

The northernmost and smallest islet, N. by E. 2 miles from the largest, lies on a reef $2\frac{1}{4}$ miles long, and three-quarters of a mile broad ; this reef is separated from the other two by a deep channel one mile wide, at the south-east entrance of which is a coral patch, with a small sand-bank on its northern edge. These reefs are surrounded by deep water close to their edges.

Anchorage.—There is good anchorage in 12 fathoms, mud, under the lee of the two south-western islets, at three-quarters of a mile to the north-westward of them.

East Islets are two small sand-banks on separate reefs ; No. 1. islet, $4\frac{1}{2}$ miles to the northward of the northernmost Boydong cay, lies on the north-west end of a narrow reef about $1\frac{1}{2}$ miles long, which appeared to be steep-to.

No. 2 islet, E.N.E. $1\frac{1}{2}$ miles from that just described, is a small sand-bank, with stunted vegetation, on the north-west extreme of a reef $2\frac{3}{4}$ miles long S.E. by E. and N.W. by W., and $1\frac{1}{2}$ miles broad. There is deep water close to these reefs, and they are separated from each other by a 9-fathoms channel, three quarters of a mile wide.

PEARN REEF, discovered in 1876 by Mr. Pearn, master of the schooner *Jo*, has 12 feet on it at low water ; it lies with the centre of Halfway islet bearing N.N.E. and the centre of the south Boydong islet S.E. $\frac{1}{2}$ E. This reef lying only a little eastward of the recommended course should be passed very cautiously.

HALFWAY ISLET, $5\frac{1}{2}$ miles East of False Orfordness, is situated on the north end of a coral reef, three quarters of a mile long, N. $\frac{1}{2}$ W. and S. $\frac{1}{2}$ E., and one third of a mile broad. The islet is covered with bushes, and in the centre is a square-looking clump of trees ; an extensive shelf of coral rock, dry at high water, and steep-to, projects from its south end.

ORFORDNESS is a sandy projection, N.W. by N. 6 miles from False Orfordness. The only object worthy of notice about Orfordness is a remarkable flat-topped hill, 650 feet high, about 2 miles south-west of it, named by Captain Bligh, Pudding-pan hill.

Orford bay, immediately to the northward of Orfordness, is too shallow and exposed to afford shelter even for small coasting vessels.

The COAST.—The coast from Orfordness to False Orfordness is

similar to that to the southward, and is skirted by shoal water, extending from half a mile to $1\frac{1}{2}$ miles from the shore. From Orfordness the general direction of the coast is N. by W. $\frac{1}{2}$ W. for $12\frac{1}{2}$ miles to some perpendicular red cliffs; it then trends N.W. by N. for $12\frac{1}{2}$ miles. The shore is low, and consists of a succession of rocky points and small bays, backed by a range of mostly barren, sandy hills, with flat-topped cliffs of a reddish colour, as far as the south-east entrance of Escape river, 4 miles to the southward of Turtle head; the low land in parts is thickly wooded.

This part of the coast, like that between Shelburne bay and Orfordness, is skirted by shoals extending about 2 miles from the shore, and which have not been minutely examined; it should therefore be approached with caution, more especially during the summer months, when it is exposed to the full force of the south-east trade winds.

TURTLE HEAD, is the south-east point of Newcastle bay and the north extreme of a bluff head-land, 2 miles wide, between the two supposed entrances of Escape river, by which it would appear to be isolated.

GILMORE BANK, 8 miles to the northward of Orfordness, is a patch of dead coral, partly dry at low water, at about $2\frac{1}{2}$ miles from the shore, and near some remarkable red cliffs of moderate height. A reef, probably connected with Gilmore bank, lies between it and what appeared to be a shoal extending from the mainland, between which and the reef there is a narrow 4-fathoms channel. But until these shoals are more closely examined, no vessel should attempt to go inside Gilmore bank, more especially as no distance would be saved by doing so.

TERN ISLET, which is small, low, and rocky, lies 7 miles to the south-eastward of Turtle head, and half a mile from Tern cliff; there is a depth of 4 and 5 fathoms inside, but shoal water runs out three-quarters of a mile to the eastward of the islet.

A small patch of 3 fathoms lies half way between Gilmore bank and Tern islet, at three-quarters of a mile to the north-eastward of some perpendicular red cliffs, with 4 fathoms water between it and the shore.

CAIRNCROSS ISLET, N.E. by E. $6\frac{1}{2}$ miles from Orfordness, is small and woody, with more soil on its centre than is usually found on these low coral islets. There are large trees upon it, visible at a distance of about 10 miles from a vessel's deck. A reef, steep-to, upon which are high rocks always above water, extends $1\frac{1}{2}$ miles to the south-eastward from the islet.

There is anchorage under the lee of Cairncross islet, but the water is deep, with foul ground, and there is not much shelter when the wind blows hard from the south-eastward.

Towards the close of the year, Cairncross islet is visited by immense flights of Torres strait pigeons, which are easily shot.

BUSHY ISLET, N.E. $4\frac{1}{2}$ miles from Orfordness, is situated on the north end of a coral reef $1\frac{1}{2}$ miles long and half a mile broad; as foul ground extends $2\frac{1}{2}$ miles towards the islet from Orfordness, or perhaps farther, no vessel should pass between Bushy islet and the mainland.

No. 1 Woody islet, $4\frac{1}{2}$ miles E. $\frac{1}{2}$ N., of Cairncross islet, is situated on the north-west end of a reef, $1\frac{1}{2}$ miles long and half a mile broad, which appeared to be steep-to.

Nos. 2 and 3 Woody islets are situated, one at either end of a reef, about $3\frac{1}{2}$ miles long S.E. and N.W., and half a mile broad. No. 2, the south-eastern and smaller islet lies $3\frac{1}{2}$ miles N.E. $\frac{1}{2}$ N. of No. 1. On No. 3 islet, which is three-quarters of a mile long, some native huts were seen in 1848.

A shoal patch lies $1\frac{1}{2}$ miles to the north-westward, and a vegetated sand-bank, on a coral reef, $3\frac{1}{2}$ miles to the northward of No. 3 islet.

A narrow reef, about one mile long, has been reported to exist N. $\frac{3}{4}$ W. 10 miles from Cairncross islet; its supposed position was sounded by the *Bramble* and her boats, but no signs of shoal water were seen.

Bushy islet (of Mr. Arnold), N. by W. $\frac{1}{2}$ W. $9\frac{1}{2}$ miles from No. 3 Woody isle, is situated on the south-east end of a reef about one mile long, on the north-west extreme of which is a small sand-bank.

x. REEF is $1\frac{1}{2}$ miles long S.E. and N.W. and half a mile broad, but being very low, is only visible at the distance of $1\frac{1}{2}$ miles; it has some bushes on its south-east end, and a sand-bank always above water, on the north-west extreme, bearing E. by N. $\frac{1}{4}$ N. $4\frac{1}{2}$ miles from Turtle head.

Beacon.—A square black beacon is erected on the north-west end of **x.** reef.

y. Reef, N.E. $7\frac{1}{2}$ miles from Turtle head, and $4\frac{1}{2}$ miles N. $\frac{3}{4}$ E. from the sand-bank on **x.** reef, is about 2 miles long, East and West, and three-quarters of a mile broad; all the reef but the east end, on which are a few mangroves, is covered at high water.

z. REEF, three-quarters of a mile to the westward of **y.** reef, is 3 miles long, East and West, and about 2 miles broad. There is a sand-cay on the east end of the reef, and in 1845 there were two dry patches of sand on its western extreme; but in 1862, Mr. Rac, in the ship *Wee Tottie*, only saw one, and this, like the whole of the reef except the sand-cay on the east extreme, was covered at high water. The western point of **z.** reef, from which a shoal spit projects three-quarters of a mile to the north-west, lies N. by E. $\frac{1}{4}$ E. 6 miles from Turtle head. There is also foul ground close to the north-west point of the reef.

There are some shoal patches about $1\frac{1}{2}$ miles to the westward of the spit of **z.** reef, nearly a mile in extent, with from 7 to 11 fathoms water round them; the least depth found on these patches, by the boats of *H.M.S. Rattlesnake*, was 4 fathoms; there are strong tide rippings on them, which generally show their positions in the day time; and they may be avoided by passing at about half a mile to the westward of **z.** reef.

Beacon.—The western end of **z.** reef has a square black beacon on it.

HARRINGTON SHOAL is a coral patch lying $1\frac{3}{4}$ miles north-westward of the west extreme of **z.** reef; it is about 200 yards long North and South, and 100 yards wide, and has 2 fathoms water on the shoalest part. From the shoal in 4 fathoms, the west summit of Turtle island bore South, and the summit of Albany island N.W. by W.

The **ENGLAND SHOAL**, on which the British ship *England* struck in April 1874, lies in the track of vessels passing between Albany island and the Brothers; the least water obtained was 15 feet at about low water, with 12 fathoms immediately to the northward of it. From the shoal, the North Brother bore N. by W., and **z.** reef beacon S.E. distant $3\frac{1}{2}$ miles.

NEWCASTLE BAY is $10\frac{1}{2}$ miles broad N.N.W. $\frac{1}{2}$ W. between Turtle head and Fly point, and about $4\frac{1}{2}$ miles in depth, to the entrance of Kennedy river. From the northern entrance of Escape river, 3 miles to the westward of Turtle head, a low sandy shore backed by flat wooded land, trends nearly 4 miles in a north-westerly direction to Kennedy river, where the inlet is $3\frac{1}{2}$ miles broad. From the northern side of this opening, the north-west shore, which forms the base of a low coast range, extends in nearly a direct line to Vallack point, $1\frac{1}{2}$ miles to the south-westward of of Fly point.

The shoal which skirts the shore from Tern islet, north-westward, to Turtle island continues round Newcastle bay to the bar of Kennedy river, and from thence to Fly point; the outer edge is about $2\frac{1}{2}$ miles distant from the entrances of Escape and Kennedy rivers; but it afterwards closes the north-west shore, towards Vallack point.

From between Vallack and Fly points several rocks and shoals extend about 3 miles to the south-eastward; Ulfa rock lying half a mile; a sand-bank, which only covers at high-water springs, $1\frac{1}{2}$ miles; and a small sunken rock on a shoal bank, $2\frac{1}{4}$ miles, from Fly point.

Outside the shoals skirting Newcastle bay, the water gradually deepens to 5 and 6 fathoms; but the bay affords no shelter from the prevailing south-east winds.*

* See Admiralty plan of port Albany, No. 1,937; scale, $m=2$ inches.

Turtle island, about $1\frac{1}{2}$ miles to the north-eastward of Turtle head, is small, rocky, and situated near the northern extreme of a shallow spit, running out $1\frac{1}{4}$ miles from the head. Two detached shoals with $2\frac{1}{2}$ fathoms on them lie to the north-westward of Turtle island, one distant $1\frac{1}{2}$ miles, and the other $2\frac{1}{2}$ miles.

Kennedy river.—This river derives its name from Mr. Kennedy, who, after a disastrous journey from Rockingham bay in 1848, was barbarously murdered by the natives, near the river, when only accompanied by a single follower. The latter, a black native of New South Wales, with great difficulty escaped to Cape York.

The river has a small rocky islet on the northern side of its entrance, and a bar extends across it, but Commander Carnegie, of H.M.S. *Salamander*, who ascended the river in 1864, says, that vessels drawing from 10 to 12 feet could enter at high water. For the first 7 or 8 miles inside the bar there are depths of from $2\frac{1}{2}$ to 5 fathoms, the river being wide, but much encumbered with mud flats; it then narrows and becomes shoal, with occasional deep holes, and at about 18 miles from the bar becomes lost in a swamp.

The banks are mud covered with mangroves, the only landing place found being near the head of the river, where at low tide the water was nearly fresh.

ALBANY ISLAND, (*Pabaju*), a prominent object northward of Newcastle bay, is of moderate height, nearly 3 miles long S.E. and N.W., and $1\frac{1}{4}$ miles broad, from point to point, across its centre. It is separated from the mainland, to the south-eastward of Cape York, by Albany pass, a deep channel of about one third of a mile broad. Albany island is mostly covered with a light stony soil, which produces a coarse kind of grass; there are also a few stunted trees and some scrub on different parts of the island.

Ulrica point, the south-east extreme of Albany island, and three quarters of a mile E. by N. of Fly point, is steep and rocky, with shoal water extending one third of a mile to the south-eastward of it.

Charlotte and Alfred points are two bluff headlands projecting from the eastern side of Albany island, the former being one mile, and the latter $1\frac{1}{2}$ miles to the north-westward of Ulrica point. Vicary and Robinson bays, formed between these bluffs, are too shallow and exposed to be worthy of notice.

Frederick point.—To the westward of Arethusa point, the northern bluff of the island, which is 200 feet high, the shore is low, but Frederick point, the north-west extreme, is a rocky projection, from which a dangerous ledge, awash at low water, springs, runs 300 yards to the south-westward.

Albany rock, N. $\frac{3}{4}$ E. $1\frac{1}{4}$ miles from Ulrica point, is a remarkable peaked islet, with a few stunted pandanus trees growing upon it. A rocky patch with 6 feet water, lies 2 cables S.E. of the south-east point of the islet. Albany rock may be passed on its eastern side, at the distance of a quarter of a mile, if necessary, in from 7 to 13 fathoms water.

A very narrow sand-bank, about 200 yards long East and West, which is nearly awash at low-water springs, lies N.N.W. 4 cables distant from the peak of Albany rock.

Peake rock, half a mile S.S.E. of Albany rock, is a rocky patch awash at low-water spring tides, about 300 yards in extent.

Mai islet, close to the westward of Albany rock, is small and rocky; between it and Charlotte point is a smaller islet, named Pitt rock. The first two islets are connected by a shoal with 4 feet on it, but there is a very narrow deep water passage between the shoal water surrounding Mai islet and Pitt rock.

Tree islet, half a mile North of Arethusa point, is small, but of moderate height, and was remarkable in 1849 from two trees growing on its highest part.

Bush islet, which is similar in aspect to the others, lies close to the southward of Tree islet, with which it is connected by a shoal, but there is a narrow deep water channel between it and Arethusa point. Foul ground, with narrow winding channels, extends eastward and south-eastward of these two islets and fronting Pioneer bay, between Arethusa and Alfred points, which is also filled up with very shoal water extending two-thirds of a mile from the shore. The whole space between Albany rock and Tree islet should be given a good berth, as there is deep water close up to the edge of the shoals.

A narrow shoal, with 2 fathoms on it at one mile from Tree islet, and terminating in 4 fathoms, extends W. by N. $\frac{1}{4}$ N. nearly $1\frac{1}{4}$ miles from Tree islet, the extreme bearing N.N.W. $\frac{1}{4}$ W. nearly $1\frac{1}{4}$ miles from Frederick point. Vessels passing Tree islet must be careful to avoid the northern edges of the shoals on either side of it, which have from 4 to 9 feet water on them.

MID-ROCK is a very dangerous patch, about 2 cables in extent, with 16 feet water on it, lying nearly in mid-channel between Great Mount Adolphus island, to the north-eastward, and cape York; it lies N. $\frac{1}{4}$ W. $1\frac{1}{4}$ miles from Tree islet, and with the south-east extremes of Mount Adolphus island and Morilug islet in line N.E. by E. $\frac{3}{4}$ E.

PORT ALBANY is nearly the central of a succession of small bays which, with steep rocky head-lands, form the south-west side of

Albany island, and is situated at about $1\frac{1}{2}$ miles to the north-westward of Ulrica point. A coral shelf, with from one to 5 feet water on it, skirts the shore to the extent of 30 to 80 yards from low-water mark, when the depth suddenly increases to 5 and 7 fathoms. A narrow shoal, with from 14 to 17 feet water on it, occupies much of the north-western half of the port, but there is a space of deep water in the southern portion of the bay, from 100 to 130 yards broad, within the influence of the tide streams, which would afford excellent shelter to a steamer of any size, from either monsoon, and protection from the stream, if warped in; and moored close to the shore.

At port Albany, opposite to Somerset, there is a pearl-fishery station, consisting of cottages, sheds, &c. There are several fishing-boats belonging to this and to the station at Somerset.

THE COAST from Fly point trends N.W. $\frac{1}{2}$ W. nearly $2\frac{1}{2}$ miles to Osnaburg point, and consists of a succession of small shallow bays and bold rocky points, forming the south-west side of Albany pass.

ALBANY PASS, the narrow strait which separates Albany island from the mainland just described, is so straight in its general direction, that it may be seen through from end to end. Its average width is $3\frac{1}{2}$ cables, and the depth of water from 6 to 13 fathoms. It is clear of dangers, with the exception of the rocky ledge projecting $1\frac{1}{2}$ cables' lengths to the south-westward of Frederick point, and from which shoal water extends south-eastward to the next point.

SOMERSET.—About $4\frac{1}{2}$ miles south-eastward of Cape York, and midway between Fly and Osnaburg points is Somerset bay, 4 cables wide, but nearly filled up by a reef. The settlement of Somerset lies round the north-west side of the bay; the Government establishment has been transferred to Thursday island, and a private firm now occupy the buildings and sheds for a Pearl fishing station. The mail steamers have ceased calling here, and it is no longer the head quarters of the Pearl fishery.

Climate.—Somerset and its vicinity is healthy for Europeans, it being remarkably cool for the tropics, during the greatest part of the year. The N.W. monsoon is the rainy season which usually lasts from December to March; during this period it is often very hot and oppressive, and mosquitoes are numerous.

Supplies.—Fish may be caught by using the seine in the various bays in Albany pass.*

* Remark book, Commander H. J. Martin, H.M.S. *Rosario*, 1871.

Water.—A never failing supply of fresh water can be easily procured by digging ponds 2 or 3 feet deep, at a few yards above high-water mark, in the south-west corner of Somerset bay.

There is also plenty of water on Albany island; that at port Albany is excellent, and flows fast from a spot on the beach in the south part of the bay; it is considerably below high-water mark, and is difficult to find. At Seymour point, water springs from the upper part of it, and flows into several pools below, and into a cavern just above high water. The water in the south part of Cool bay is excellent, and only about 20 yards from the beach. A fine spring rises on the summit of Arethusa point, flowing gently down to a native well about 50 yards from the beach.

DIRECTIONS.—A vessel from the southward proceeding to port Albany or Somerset bay, having cleared Harrington rock and the shoal patches to the westward of *z.* reef, noticed at page 295, should bring the peak of York island—which is easily seen through Albany pass—on with the outer extreme of Osnaburgh point; this mark will clear the shoals extending to the south-eastward from Fly and Ulrica points, and lead the vessel in mid-channel, up to either anchorage.

Albany pass being narrow, with high land on either side, a large sailing vessel should not attempt it, except under very favourable circumstances, as the strong tide streams would, with baffling winds, render her unmanageable, but with a commanding breeze blowing through, a vessel may run against the stream, anchoring off either port and mooring.

Ships intending to communicate with Somerset should anchor off the fishing station in Somerset bay, and not in port Albany, as from the strength of the tides in the centre of the pass, and the violence at times of the south-east monsoon, there would often be a difficulty in communicating with the station.

The edge of the reef in Somerset bay is marked by stakes and a black buoy on the north-western extremity, a measure which greatly facilitates ships picking up the anchorage; care must be taken to keep Osnaburg point shut in by Somerset point, anchoring so that the ship will just swing clear of the stakes. In this position little or no tide is felt, the holding ground is good and the anchorage sheltered from all winds except east-south-east.

Vessels should moor immediately, as from the strength of the tide in the pass numerous eddies occur in the bay. There is snug anchorage for about four ships if well moored.

TIDES.—It is high water, full and change, at port Albany at 0h. 15m.; springs rise 10 and neaps 7 feet. From observations made in September 1874, there appears to be a considerable diurnal inequality in

the tides at this port, the night tide then rising nearly twice the height of the day tide.

The ordinary method of calculating the time of high water is therefore not applicable here.

The streams are very rapid in Albany pass, running as much as 5 knots an hour, and cause a confused sea when running in an opposite direction to the wind. The tidal streams turn an hour after high and low water by the shore.

OSNABURG POINT is a steep cliffy bluff, of coarse sand-stone, S. $\frac{3}{4}$ W. nearly two thirds of a mile from Frederick point, the north-west extreme of Albany island. Between Somerset and Osnaburg points is Stover bay, apparently filled up by a shoal, with 6 or 7 fathoms water close to the edge. In the bight of the bay is a small stream running round the back of Somerset.

Between Osnaburg point and Ida island, which lies N.W. by W. $\frac{1}{4}$ W. $1\frac{1}{2}$ miles from the point, is a shallow bay, divided into two bights by Bishop point, which is also a high bluff head-land. In the western bight, Mew rivulet, a stream of good fresh water, runs into the sea, close to the southward of a low rocky point; but this—the only fresh water stream in the neighbourhood—is lost to any useful purpose, as the bay is so completely occupied by a mud-flat, that even boats could not approach the mouth of the rivulet. The edge of the flat, which extends in nearly a direct line from Ida isle to Osnaburg point, is steep-to, with from 6 to 8 fathoms close outside.

YORK ROAD.—Between the edge of this bank, and the shoals extending to the north-westward from Albany island, large vessels may find a spacious roadstead, which would also be a secure anchorage during the south-east monsoon, where it not for the strong tide streams which run through Albany pass.

EVANS BAY extends from Ida island N.W. by W. one mile to Evans point, and is about half a mile deep. Ida island, which forms a high rocky ridge half a mile long, is separated by a narrow boat channel from Ida point, a low rocky projection, affording the best landing place in Evans bay. A sandy beach mostly backed by scrub and stunted trees, extends from Ida point to Evans point, which is a smooth double point, stretching out from mount Bremer.

Anchorage.—As shoal water extends from the beach to a line from Ida island to Evans point, there is not sufficient depth within for any other than small vessels; but the best anchorage for large vessels in the south-east monsoon, is in $6\frac{1}{2}$ fathoms, sand and mud, with Ida point bearing S. $\frac{1}{4}$ W. and Sextant rock—which lies half a mile to the eastward of Evans point, in line with the east end of Eborac island bearing N.W.

In the north-west nonsoon there is better shelter a little more to the W.N.W., at one quarter of a mile from Sextant rock.

Water may be procured in wells dug at the back of the beach in Evans bay, at one third of a mile within Ida point, and at three quarters of a mile farther to the north-westward. Even when blowing hard, there is seldom so much surf on the beach as to prevent boats bringing off water; the only inconvenience is the strength of the tide streams, which set N.W. and S.E., the greatest strength being from 2 to 3 knots.*

SEXTANT ROCK, which is flat and only 5 feet above high-water, is situated on the inner edge of a bank 2 miles long S.E. and N.W. fronting Evans bay and the coast nearly up to cape York. Vessels not drawing more than 12 feet may cross any part of this bank, excepting for one quarter of a mile north-west of the rock where there is only 15 feet water; but large vessels should not attempt it on the north-west side of Sextant rock, and to the south-eastward of it, not to approach nearer than one mile from the rock, on account of some $3\frac{1}{2}$ fathoms knolls; those most in the way of vessels passing outside, or entering Evans bay from the northward, lying half a mile to the north-eastward of Sextant rock.

Geographic position.—Sextant rock is most deserving of notice from its being the spot selected by Captains Blackwood and Stanley as their chief meridian, to the westward of Sydney, for the surveys of the east coast of Australia, Torres strait, New Guinea, and the Louisiade archipelago; and from the mean of numerous observations by various observers, is considered to be in lat. $10^{\circ} 41' 32''$ S., and long. $142^{\circ} 33' 18''$ E., assuming Fort Macquarie to be in $151^{\circ} 14'$ E.

CAPE YORK, the northernmost extremity of Australia, is a prominent feature of the mainland, and occupies the most commanding position on the south side of Torres strait. Mount Bremer, its highest part, is a well-defined peaked hill, rising to an elevation of 409 feet, at two-thirds of a mile to the southward of the extremity of the cape; it is wooded to the summit, and is a very conspicuous object, at a considerable distance.

York and Eborac islands, lying close together off cape York, are both small and rocky; York island, which is about one-third of a mile long North and South, rises to a peak 283 feet high; and is separated from the cape by a deep channel one cable wide.

Eborac island, eastward of York island, is one-third of a mile long East and West; near its east end is a rock above water, and a similar rock

* H.M.S. *Hecate* in 1863, found the tidal stream in Evans bay running more than 3 knots per hour.

lies between the two islands. Both islands are steep-to on their outside, and Eborac island may be approached in 11 and 12 fathoms water, to within one quarter of a mile. A fringe of shoal water extends about a cable off the south side of Eborac island.

DIRECTIONS.—A vessel from the southward entering York road or Evans bay, after passing Albany rock and Tree islet at the distance of about half a mile, should steer West until Osnaburg point bears S. by E. $\frac{1}{2}$ E., when she may haul in for York road, taking care to avoid the end of the shoal extending to the westward of Tree islet, and also a $3\frac{1}{2}$ fathoms knoll lying N. by E. one mile from Bishop point. The most convenient anchorage out of the strength of the tide-stream, is in 6 to 8 fathoms, with the peak of Albany rock in line with Arethusa point, Albany island, and Osnaburg point, bearing S. by E. $\frac{1}{2}$ E.

Evans Bay.—In entering Evans bay from the southward, proceed as for York road until the east end of Ida island bears S.W. by S.; then stand in about S.W. by W., allowing for the tide, for the anchorage described at page 300.

In entering from the northward, pass three-quarters of a mile outside Sextant rock, if a large vessel, and then make for the anchorage, taking care to avoid the $3\frac{1}{2}$ fathoms knolls lying half a mile to the north-eastward and E. by S. one mile from Sextant rock, the former of which will be avoided as long as Albany pass is not seen quite through.

York Road and Albany Pass from the Northward.—A vessel of no great draught, having rounded Eborac isle at the distance of one quarter of a mile, will have Albany pass plainly open, and may steer—making due allowance for the tide stream—S.E. $\frac{1}{2}$ E. for it, passing one-third of a mile outside Sextant rock. If intending to anchor in York road, steer eastward when Ida isle bears West, and anchor as before directed.

Port Albany.—If bound for port Albany from the northward, keep Albany pass constantly open after passing Sextant rock, as by doing so, the rocky spit projecting from Frederick point, and the edge of the shoal from Ida isle to Osnaburg point will be avoided. If Paget point, the next projecting point south of Frederick point, touches Fly point, the vessel will be too far to the north-eastward; and if Fly point approaches too near Osnaburg point, she will be too far to the south-westward.

TIDES.—It is high water in Evans bay, full and change, at 11 h. 15 m.; springs rise 10 feet, and neaps 4 feet.

THE BROTHERS are three large rocks, nearly in line, S.E. by E and N.W. by W. South Brother, nearly $3\frac{1}{2}$ miles E. $\frac{1}{2}$ N. from Albany rock, consists of a cluster of large rocks above water, situated on the south-east end of a reef three-quarters of a mile long, and half a mile broad, which dries at low water.

Middle Brother is situated on the north-west extreme of the same reef as South Brother, from which it bears N.W. three-quarters of a mile; it is a single rock, and much higher than those just described. Shoal water extends 2 cables to the southward, and about half a mile to the northward from the edge of the reef, the depth being from 2 to $2\frac{1}{2}$ fathoms.

North Brother, two-thirds of a mile to the north-westward of Middle Brother, is higher than the others, and whitened by birds; but although visible at a distance of 6 or 8 miles from a vessel's deck, it is not always a conspicuous object. This rock is in the centre of a reef nearly one mile in circumference, between which and the shoal water northward of the Middle Brother is a channel about one quarter of a mile broad.

South ledge, a large reef one mile to the eastward of the Brothers reef, 5 miles long E.S.E. and W.N.W., and 2 miles broad; it dries at low water, and its edges are steep-to. There is a deep clear channel between this reef and the Brothers reef.

North ledge is $3\frac{1}{4}$ miles long, and $1\frac{1}{4}$ miles broad at its north-west end, from which it narrows south-eastward to a point; it extends nearly parallel with the north-eastern edge of South ledge, from which it is separated by a narrow deep channel. This reef, which also dries at low water, has a small 3-fathoms patch, at half a mile off its north-west extreme.

At about one mile E. by N. from the north-east extreme of North ledge is a low wooded islet, on the western side of a reef $2\frac{1}{2}$ miles in circumference; and at S.S.E. 2 miles from the islet is a sand-bank on the north-west edge of a reef 4 miles in circumference; a small patch lies midway between them, and there is a clear channel between these and North ledge. Other reefs extend to the north-eastward, the limits of which have not been determined.

MOUNT ADOLPHUS ISLANDS, originally named York islands, by Captain Cook, lie about $6\frac{1}{4}$ miles to the north-eastward of cape York, and are high, rugged, and partially clothed with stunted trees and scrub.

Mount Adolphus, the summit of the southernmost and largest island of the group, is a remarkable flat-topped hill 548 feet high, and is very conspicuous from all directions. The island is about $2\frac{1}{4}$ miles long, North and South, and $1\frac{1}{4}$ miles broad.

Blackwood bay is an indentation on the west side of Great Mount Adolphus island, between Dickey and Forbes points, it is one mile long, and three-quarters of a mile deep, and has good anchorage in from 4 to 6 fathoms, mud, sheltered from the south-east monsoon and the rapid tide streams prevailing in the neighbourhood. A long narrow shoal named Blackwood bank extends across the bay, with 2 fathoms water on

either end, and from 3 to $3\frac{1}{2}$ fathoms between. The south entrance into the bay is a clear passage nearly 2 cables broad, between the south-eastern end of the shoal and Dickey point.*

For repairing or refitting a vessel during the south-east monsoon, Blackwood bay will be found a very convenient harbour; but, although Mount Adolphus islands are not permanently inhabited, due caution must be observed with respect to the natives of the mainland and the adjacent islands, as they constantly move about in large canoes.

Cambridge point, the south-west extreme of Great Mount Adolphus island, is a steep projection which may be passed in 11 or 12 fathoms water, at one quarter of a mile from the shore. The coast from this point, around eastward, to Forbes head appears bold, but it has not been closely examined.

Supplies.—Fresh water, in small quantities, may sometimes be procured in cavities of the sloping rock inside Dickey point; and wood fit for fuel is abundant on most parts of the island.

TIDES.—It is high water in Blackwood bay, full and change, at 0h. 15m.; the greatest rise observed, the day after full moon, was 11 feet.

DIRECTIONS.—A vessel entering Blackwood bay from the southward may round Cambridge and Dickey points boldly; when the latter point bears South, she is within the shoal, and may anchor in 4 or 5 fathoms, as most convenient.

The northern entrance, between Forbes point and the north-west end of the narrow shoal, is one-third of a mile wide, and will be found more convenient for going out of the bay, with the prevailing south-east winds. The end of the shoal may be passed at the distance of one quarter of a mile, and when Forbes point bears to the southward of East, a vessel may haul to the westward, and proceed through Torres strait, by Endeavour strait; or the better route through Prince of Wales channel.

Aoolnoh islet is a mere rock, E. by S. $\frac{1}{2}$ S. $1\frac{1}{4}$ miles from Cambridge point; it is surrounded by a shoal which extends half a mile to the northward of it; and a small $2\frac{1}{2}$ -fathoms patch lies E.S.E. nearly one mile from the islet; the water is deep round them, and between them and Great Mount Adolphus island.

Morilug islet is a peaked rock, about half a mile in circumference, one mile to the eastward of Great Mount Adolphus island, from which it is separated by a deep channel; it is surrounded by a shoal, and a

Blackwood bay in Admiralty plan of port Albany, No. 1,937; scale, m = 2

3-fathoms rocky patch lies about half a mile to the southward of it, with deep water between them.

The north-western portion of Mount Adolphus group consists of two small hilly islands lying close together, the north-eastern and larger, is nearly 3 miles in circumference, and has a shoal extending about one mile to the southward, on the east side of the smaller island.

Several rocky shoal patches with strong ripples over them lie $1\frac{1}{2}$ miles westward of the north-west point of the northern island, but the channel between has deep water; nearly $1\frac{1}{2}$ miles northward of the same island a rock has been reported, but its existence is doubtful.

Although there is deep water between the north-western islands of the Adolphus group and Great Mount Adolphus island, it cannot be considered a safe channel, on account of several shoals, and rocks above water, which nearly block up its north-eastern entrance, and are the more dangerous on account of the strong tide streams which frequently set through.

REMARKS on CAPE YORK.*—The country in the immediate vicinity of Evans and Cape York bays, consists of low wooded hills, with small valleys, and plains of greater extent. At the back of the coast, where the country is flat, there is usually a narrow belt of dense bush or jungle. In the valleys one finds, what in the colony of New South Wales would be termed open forest land, characterized by scattered eucalypti and other trees, and a scanty covering of sedge-like grass, growing in tufts, on a red clayey soil, covered with nodules of iron-stone and coarse quartzite sand. As characteristic of this poor soil, the first objects to attract the attention are the enormous pinnacled ant-hills, of red clay and sand.

Mew rivulet, already described, falling into the shallow bay to the southward of Ida island, was traced to about five miles above its mouth, where its source was found to be a spring, among rocks, in a dense scrub. It waters a fine valley, running nearly East and West, behind the hills to the southward of Evans bay, and its line is marked by a belt of tangled brush exceeding in luxuriance anything of the same description seen often elsewhere. The variety of trees in this dense brush was very great.

The lower part of the valley is open forest land, or nearly level and thinly-wooded country, covered with tall coarse grass; farther up it becomes more beautiful. From the belt of wood concealing the windings of the river, grassy sloping meadows extend upwards on each side to the flanking ridges, which are covered with dense scrub, occasionally extending in straggling patches down to the water.

The soil of these meadows is rich sandy loam, affording great apparent facilities for cultivation, from the proximity to what is probably a never

* Extracted from "The Voyage of H.M.S. *Rattlesnake*," by Mr. Macgillivray, Vol. I., pp. 127, 319.

failing supply of fresh water. Here, at the end of the dry season, and before the periodical rains had fairly set in, the stream half-way up, was found to be 6 feet in average breadth, slowly running over a shallow, gravelly, or earthy bed, with occasional pools from 2 to 4 feet deep.

The rock in the immediate neighbourhood of cape York, is a porphyry with soft felspathic base, containing numerous moderately sized crystals of amber-coloured quartz, and a few larger ones of flesh-coloured felspar. It often appears in large tabular masses split horizontally and vertically into blocks of all sizes. At times when the vertical fissures predominate and run chiefly in one direction, the porphyry assumes a slaty character, and large thin masses may be detached.

In the brush may be found a few kangaroo and emu, the brush-turkey, megapodius and white pigeon; and in the forest flocks of white cockatoos and other birds. Snakes, although not very numerous, yet require being carefully looked for, as amongst others, was found the brown snake of New South Wales, where its bite is considered fatal.

Fish are plentiful, and may be caught with hook and line from the rocks, or at a short distance off; and the sandy beach of Evans bay is well adapted for hauling the seine. Turtle were frequently speared by the natives in the water, but none were seen on shore.

The physical characteristics of the natives of cape York differ in no respect from those seen on other parts of the east coast of Australia. From the frequent visits of H.M. surveying vessels, a most friendly intercourse was established, and continued without any unpleasant interruption. There appeared to be a good understanding between these people and the islanders of the southern part of Torres strait, by whom cape York is much frequented during their occasional, perhaps periodical, migrations.

INNER ROUTE FROM CAPE MELVILLE TO CAPE YORK.

From CAPE MELVILLE to CAPE SIDMOUTH

the Inner route is bounded to the northward and eastward by the Pipon islets and Oswald reef; **b.**, **c.**, **g.**, and **h.** reefs, **i.** and Pelican islets; **m.** reef; No. V. Claremont isle, and Nos. VI. and VII. reefs; No. VI. has a light-vessel moored off its western side.* See page 273.

And is bounded to the southward and westward, by Channel rock, close off cape Melville; Low woody island, **a.** shoal, and cape Flinders; **d.**, **e.**, and **f.** reefs; by Nos. I., II., III. and IV. Claremont isles; **p.** reef and the shoal water extending from Red cliff, Heath rocks, and **q.** reef.

* See Admiralty chart of Australia, East coast, Sheet xviii., No. 2,35; scale, $m=0.25$ of an inch.

The narrowest part of the route is $1\frac{1}{2}$ miles wide, between Pipon islets and Channel rock ; and its greatest breadth is 20 miles, between **c.** reef and the bight of Princess Charlotte bay.

The soundings in the eastern part of this route range from 12 to 18 fathoms, but after passing **d.** reef shoals from 10 to 12 ; the bottom is generally sand and mud.

CAUTION.—The dangers requiring more than ordinary attention are **a.** shoal, and the spit running out to the south-westward from Low Woody isle, **p.** covered patch, Heath rocks, and **q.** coral patch.

From CAPE SIDMOUTH to CAPE GRENVILLE, the Inner route is bounded to the eastward, by the inner edge of the reef lying to the northward of No. VII. reef ; **tt.** and **v.** reefs ; Sherrard islands ; No. X. islet and reef ; and **y.**, **z.**, and **a.** reefs ; Caroline rock, **b.**, **c.**, **e.**, **g.**, **h.**, **i.**, and **k.** reefs ; Piper islands light-vessel ; **l.** and **m.** reefs ; and Haggerstone islet.*

The Inner route is bounded to the westward by **r.** shoal off cape Sidmouth ; Chilcott rocks ; No. IX. and Night islets ; **u.** reef, and Dugdale rock ; the shoal water which continues from **u.** reef to Lansdown reef which surrounds cape Direction, by a line from thence to the rock off Restoration island ; Rocky islet ; Middle reef in Weymouth bay ; Kangaroo shoals, running out from Fair cape ; Piper islands ; Young islet, with rock awash $1\frac{1}{2}$ miles south-east of it ; and Home islands.

The narrowest part of this portion of the route is one mile wide, between Piper islands reef and **i.** reef ; and the greatest breadth is 6 miles, between **g.** reef and the southern part of Temple bay.

The soundings range from 12 to 16 fathoms, and the bottom is chiefly mud.

During the height of the south-east monsoon, a strong current sets to the northward, between capes Weymouth and Grenville, generally following the direction of the channels.

CAUTION.—Although the position and even existence of the patch between **u.** reef and Dugdale rock is doubtful, the locality assigned to it should not be passed without a good look-out. The other dangers which require most vigilance are Chilcott rocks, awash ; Dugdale rock always covered ; and Young islet, awash at high water.

From CAPE GRENVILLE to CAPE YORK, the Inner route is bounded to the eastward by **q.** sand-bank ; Cockburn, **t.**, **v.**, and **w.** reefs ; Boydong cays, Pearn reef, and Halfway island ; Cairncross island and reef, with the doubtful reef, said to lie about 10 miles to the

* See Admiralty chart of Australia, East coast, Sheet xix., No. 2,353 ; scale, $m=0\cdot25$ of an inch.

northward of it; **X.** and **Z.** reefs, Harrington shoal, the Brothers, and Mount Adolphus islands.*

To the westward the Inner route is bounded by Sunday, Bird, Macarthur, and Hannibal islands; False Orfordness; Bushy islet; Gilmore bank; Tern and Turtle islets; the 4-fathom patches westward of **Z.** reef, and the shoals extending to the south-eastward from Fly point; England shoal; Albany and Mid rocks.

The greatest breadth of the route is 9 miles, between the western Boydong cay and the mainland; and the narrowest part is $1\frac{3}{4}$ miles, between Harrington shoal and the 4-fathom patches westward of **Z.** reef.

Between cape Grenville and Bird islands the depth of water is from 18 to 22 fathoms, but north of the islands the soundings are generally very regular, the average depth being 14 fathoms, over a bottom chiefly of mud.

CAUTION.—Good look-out should be kept for the doubtful reef to the westward of Cockburn reef, Pearn reef, and the doubtful reef northward of Cairncross island; for the patches to the westward of **Z.** reef, and for Mid rock.

The current in this part of the Inner route is not usually so strong as it is immediately to the southward, but during the south-east monsoon there is a considerable set to the northward.

GREAT BARRIER REEFS FROM CAPE MELVILLE TO THE PARALLEL OF CAPE YORK.

OPENINGS off CAPE MELVILLE.—From the elbow of the Great Barrier reefs near the opening, N. by E. $\frac{1}{2}$ E. 13 miles from cape Melville, described at page 262, the barrier trends 15 miles to the westward, forming a bight, and consisting of a chain of detached reefs, between which are five openings, varying from three-quarters of a mile to nearly $1\frac{1}{2}$ miles in breadth. The widest two of these openings are the third and fourth from the eastward, bearing respectively N. by W. $\frac{1}{2}$ W. 11 miles, and N.N.W. $\frac{1}{2}$ W. 13 miles from cape Melville; the former has No. 2, and the latter No. 3 sand-bank on its eastern side.†

Although these channels are safe, and lead directly from the open sea into the Inner route, without any shoals in the way, besides the barrier, they have hitherto been considered to lie too far to the southward to be of

* See Admiralty chart of Australia, East coast, Sheet xx., No. 2,334; scale, $m=0\cdot25$ of an inch.

† See Admiralty charts, Australia; East coast, Sheet xviii., No. 2,352; scale, $m=0\cdot25$ of an inch; and Coral sea and Great Barrier reefs of Australia, Sheet 2, No. 2,764; $ls, m=0\cdot04$ of an inch.

any use to general navigation, but under certain circumstances, detailed in note at page 416, they might become of great value.

No. 5. SAND-BANK OPENING.—From No. 4. sand-bank on the inner edge of the reef at the western end of the bight just mentioned, the barrier, consisting of long well-defined reefs, from half a mile to 2 miles broad, extends N.W. $\frac{1}{2}$ N. 33 miles, to First 3 mile opening. At about midway between is a channel three-quarters of a mile wide; and as its direction is N.E. and S.W. and the water deep, a vessel with the prevailing south-east wind, may enter without any difficulty. On the extreme of the reef forming the south-east side of this opening is a small dry sand-bank (No. 5.), in lat. $13^{\circ} 43' S.$, long. $144^{\circ} 14' 45'' E.$; the high peak of Flinders group bears from it S. by E. $\frac{1}{4}$ E., distant 29 miles, and in clear weather is easily distinguished.

There is another opening, one mile wide, at 4 miles to the north-westward of No. 5. sand-bank; it has not been sounded, but from its appearance from the mast-head, there can be no doubt of its being a clear and safe channel.

At $3\frac{1}{2}$ miles farther to the N.W. is No. 6. sand-bank, which is also dry.

FIRST 3 MILE OPENING.—The two points of the barrier between which this channel runs, bear from each other W. by N. and E. by S. distant about 3 miles. On the north-west side is a dry sand-bank (No. 7.) in lat. $13^{\circ} 26' 30'' S.$, long. $144^{\circ} 1' E.$ The water is deep in the channel, and it seems clear of all dangers, except a small coral shoal at about three-quarters of a mile from the western side. A small sand-bank lies about 6 miles within the opening.

No. 8. Sandbank, N. by W. $\frac{3}{4}$ W. $4\frac{1}{2}$ miles from No. 7. sand-bank, is slightly vegetated, and situated on the northern end of a detached reef, about $1\frac{1}{2}$ miles long.*

Clear navigable water within the Great Barrier reefs was first met with off cape Melville, and was generally found to continue so to the northward, there having been very few dangers visible from the mast-head, in the direction of the mainland, as the *Fly* and *Bramble* ran along inside the reefs, at a distance of 2 to 4 miles. There are, however, numerous and extensive reefs between this comparatively clear channel and the Inner route, the inner edges of which have already been described at pages 270–273.

From No. 8. sand-bank, the barrier trends N. by W. 19 miles, to a sharp spit forming the east side of Second 3 mile opening. At $1\frac{1}{2}$ miles to the south-westward of the spit is a black rock, always above water on the

* See Admiralty chart of Australia, East coast, Sheet xix., No. 2,353; scale, $m = 0^{\circ} 25$ of an inch.

inner edge of the reef. A small coral patch lies W.S.W. one mile from the rock, with a depth of 5 fathoms between them.

The barrier from No. 8. sand-bank to Second 3 mile opening varies from half a mile to $1\frac{1}{4}$ miles in breadth.

Between No. 8. sand-bank, and $6\frac{1}{2}$ miles to the northward of it, are two or three openings, but too small for a vessel to attempt. The next 12 miles of the barrier is impenetrable, the outer edge being partly embayed, which is highly dangerous for a vessel to approach, especially with light winds, as the swell generally rolls in and breaks with great violence upon the reef.

SECOND 3 MILE OPENING is, as its name implies, 3 miles broad, East and West, and has a small patch of coral in its centre, in lat. $13^{\circ} 5' S.$, long. $143^{\circ} 55' E.$, from which the remarkable High Round hill on the mainland, described at page 275, bears nearly West distant 25 miles, and the peak of cape Direction nearly N.W. by W. $\frac{1}{4}$ W. 25 miles; both are easily distinguished in moderately clear weather. The point of the barrier forming the western side of the opening has some patches of sand on it, covered at high water. This is a safe opening, as there is a deep and clear channel on either side of the coral patch in the centre.

The space inside the barrier, between the First and Second 3 mile openings, is remarkably clear, there being no other dangers than those described, seen from the mast-head; and as the *Bramble* had no difficulty in crossing over from the barrier to cape Direction, and back again, there can be no hesitation in recommending this as one of the best passages in this vicinity.

From the Second 3 mile opening the barrier trends nearly N. by W. $\frac{1}{4}$ W. 40 miles; its chief characteristics being the narrowness of its reefs, and having a small isolated reef outside it.

Southern small detached reef, just alluded to, is situated 3 miles outside the barrier, in lat. $12^{\circ} 35' 30'' S.$, and long. $143^{\circ} 51' 30'' E.$ No soundings could be obtained about it, except one cast of 120 fathoms, between the reef and barrier. The sea breaks heavily on the reef.

This portion of the Great Barrier reefs is rendered historic from the openings in it having afforded preservation to Captains Cook and Bligh, when in the most perilous situations outside the reefs. See p. 417.

Bligh boat entrance is one quarter of a mile wide, and has a sand-bank, apparently awash, on its south side. It lies about 15 miles to the northward of the Second 3 mile opening, and E. $\frac{1}{4}$ N. 16 miles from the peak on cape Direction.

At 4 miles to the northward of Bligh boat entrance, is another sand-bank on the south side of a small opening which has not been sounded.

Hibernia entrance is a narrow channel through which the ship *Hibernia* entered, in 1810. It lies about $3\frac{1}{4}$ miles to the northward of the sand-bank just mentioned.

Providential channel, through which Captain Cook passed, lies $5\frac{1}{2}$ miles to the northward of Hibernia entrance, and from it cape Direction peak bears S.W. 20 miles; it is about one quarter of a mile wide, with a rock nearly in the middle of it, and although, like Bligh boat entrance and Hibernia passage, too narrow to be considered good for vessels it affords a quick way for entering; the exceedingly narrow reefs rendering the passage so short, that the transition from the heavy ocean sea to smooth water is almost instantaneous.

Of the three passages just described, Hibernia entrance may be considered the best. There are many other small openings through this part of the barrier, but not of sufficient breadth to be worthy of farther notice.

A small coral patch lies 3 miles to the north-westward of Second 3 mile opening; another, at a mile to the south-westward of Hibernia entrance, and a third close within the reef, 16 miles farther to the northward, and there may be others which might have escaped detection. But the sea within the barrier now appears so much more free from dangers than to the southward, that a vessel after entering by either of the 3 mile openings, may with a good look-out from the mast-head, steer along within the reefs, at a distance of from one to 4 miles, until one of the numerous channels through the middle reefs presents a favourable communication with the Inner route.

Between the parallel of Fair cape and 60 miles to the northward of it, the features of the Great Barrier reefs assume a different aspect from those already described to the southward. This portion of the reef now becomes more broken and irregular, and embraces the best channels usually taken by vessels proceeding through Torres strait, from the Outer route by the Coral sea.

Northern small detached reef is $1\frac{1}{4}$ miles long, North and South, narrow, and similar to that to the southward; it lies nearly 4 miles outside the barrier, in lat. $12^{\circ} 24' 30''$ S., long. $143^{\circ} 49' 45''$ E. No soundings could be obtained near it.

QUOIN ENTRANCE is a very deep and good passage through the barrier, at 4 miles to the westward of the Northern small detached reef; it is nearly three-quarters of a mile broad, and about $1\frac{1}{2}$ miles long, East and West. In making this channel from seaward, it is best recognised by the Northern small detached reef, on which the sea generally breaks heavily; or in clear weather, Quoin island may be seen from aloft, bearing W. $\frac{3}{4}$ S. 14 miles distant.

BLACK ROCKS.—From Quoin entrance the barrier trends north-eastward 16 miles, terminating at a point, on which are two black rocks, in lat. $12^{\circ} 12' 30''$ S., long. $143^{\circ} 56'$ E.; these, from being 8 or 9 feet above the level of the sea, form good marks for making Wreck bay, from the southward.

In the bight formed by the reef, 5 miles to the north-eastward of Quoin entrance, the ship *Ferguson* was wrecked in 1841; she was a conspicuous mark 5 years afterwards, and having been thrown so high on the reef as to be clear of much of the heave of the sea, it is probable that some portion of the wreck may remain many years.

DIRECTIONS.—There are two small, but clear passages, one at 2 miles to the westward, and the other one mile to the north-eastward of the above wreck, which may be taken in an emergency; for if a sailing vessel, by light winds or currents, be set into the bight, she should not attempt to work out of it again, unless she be very weatherly, but should take the first available passage that may offer, as they all appear to be clear and good.

From the small entrance, one mile to the north-eastward of the *Ferguson* wreck to the Black rocks, the reef presents one impenetrable barrier.

The next point of the barrier to the northward of the Black rocks being distant nearly 6 miles, a vessel making these rocks from the southward, will have no reefs in sight to the northward of them; this formerly led to the opinion that the barrier was skirted here by numerous detached reefs, until Capt. F. P. Blackwood's survey proved the contrary.

WRECK BAY, between the Black rocks and the next point of the barrier, N. by E. nearly 6 miles from them, is a deep circular bight of the reef, 12 miles long North and South within the entrance, and 9 miles in depth. The south side of this bay, to the westward of the Black rocks, is simply defined by the 100-fathoms line of soundings, within which the depth is irregular, varying from 4 to 21 fathoms, with numerous coral patches, on most of which the sea breaks; there are a few under water, but as they are close within the margin of what may be called no soundings, the change in the colour of the water over the patches gives a good indication of their positions.

BLACK ROCKS ENTRANCE, the broad opening in the south west part of Wreck bay, should be entered by closely rounding Black rocks, and then steering about S.W. by W. Smooth water and anchorage in 10 to 20 fathoms, will be found within the line of the detached patches, under the lee of the barrier. Clear judgment and a vigilant look-out from the most head will here ensure better success than more detailed directions.

SAFE ENTRANCE, W. $\frac{1}{2}$ N. 8 miles from the Black rocks, is

three-quarters of a mile wide, with a cluster of coral patches to the southward of it.

From the north side of Safe entrance, a very narrow reef extends 4 miles northward, to an opening half a mile wide. At one mile from the south end of this narrow reef, and W. by N. $\frac{1}{4}$ N. 8 miles from the Black rocks, the ship *Martha Ridgway* was wrecked in 1842, by drifting upon the reef during the night; as this wreck is similarly situated to that of the *Ferguson*, some portion of it may remain as a beacon for several years.

NIMROD PASSAGE, one of the most frequently used, is formed in the bight of Wreck bay, N.W. by W. 10 miles from Black rocks; it is a good opening half a mile wide, with from 32 to 37 fathoms in mid-channel, and is separated from another half-mile opening, immediately to the southward of it, by a coral reef 3 miles in circumference, on which is a small sand-bank.

DIRECTIONS.—There are several small, but clear channels in the reef from Nimrod passage, round to the north point of the entrance of Wreck bay; but as there is generally a leading wind, enabling a vessel to select either of the better passages through the southern or western side of the bay, the former need no farther description. It is recommended, in the event of a vessel having unintentionally entered Wreck bay, that she should run through either of the narrow passages which present themselves, in preference to hauling on a wind, and attempting to beat out of this bay of reefs, which with light winds, or flood stream against her, might prove fatal, as in the case of the wreck of the *Martha Ridgway*, from which circumstance the bay receives its name.

SINGLE ROCK ENTRANCE.—From the extremity of the reef forming the north point of the entrance of Wreck bay—off which is a heavy confused sea—the outer edge of the barrier trends 4 miles to the northward, and from thence north-westward $3\frac{1}{2}$ miles to Single Rock entrance, which is a safe and good channel, one-third of a mile broad, and may be known by a solitary black rock on its south-east side.

The barrier, consisting of a chain of small reefs, continues from thence N.W. $\frac{1}{2}$ W. 9 miles, to Stead passage.

STEAD PASSAGE, in lat. $11^{\circ} 55' S.$, long. $143^{\circ} 50' E.$, is one-third of a mile broad, and similar in character to the narrow openings already described; it is, however, more difficult to make, as it lies at the head of a deep bight in the reef.

YULE DETACHED REEF, 3 miles outside this part of the barrier, is $6\frac{1}{2}$ miles in circumference, and has deep water all round it. The centre of the reef lies in lat. $11^{\circ} 58' S.$, long. $143^{\circ} 59' E.$, and as it lies N.N.E. $\frac{1}{2}$ E. 4 miles from single rock entrance, and E. by S. 9 miles from

Stead passage, it may in some measure prove useful in pointing out the positions of those channels.*

The trend of the reef on either side of Single Rock entrance, being nearly parallel with the reefs forming the northern side of Wreck bay, the barrier thus assumes a projection nearly 8 miles long, S.E. by E. and N.W. by W., and 3 miles broad, the interior of which is a smooth and secure anchorage.

DIRECTIONS.—The sea within the barrier, from the parallel of Fair cape to Stead passage, appears so clear of dangers, that a vessel having entered by either of the passages within that space, will have little difficulty in proceeding to the northward, at a distance of 3 or 4 miles from the reefs, until abreast of the northern part of Wreck bay, when a course may be shaped to the north-westward for Sir Charles Hardy islands. The chart will give the best idea of the course to be steered; and a vigilant look-out from aloft will afford the greatest facility for avoiding any dangers which might be in the way.

The BARRIER, from $1\frac{1}{2}$ to 3 miles northward of Stead passage, is intersected by two or three narrow openings, through which a vessel might probably enter, if compelled by necessity, in the event of missing, or not being able to fetch Stead passage.

The barrier, which now becomes barely one quarter of a mile wide, next trends 9 miles to the north-eastward, and for 6 miles farther in that direction, is succeeded by the edge of the bank of soundings extending from the mainland, this edge being only defined by the 100-fathoms line, and the difference in the colour of the water.

There is a small opening in the barrier, at $9\frac{1}{2}$ miles to the north-eastward of Stead passage, which may be known by some rocks above water, on its northern side; but as this opening has not been closely examined, a vessel finding herself so far to leeward, and having sufficient wind, is recommended to push on 2 or 3 miles farther to the northward, and round the spit, which there terminates this part of the barrier, and off which are several small patches with from 2 to 4 fathoms water on them. Several detached coral patches on which the sea breaks lie close within the reef between the spit and the opening to the southward of it; but between Stead passage and this opening the water within the barrier is comparatively clear of shoals, close to the inner edge of the reefs. A vessel will, however, find more convenient anchorage in 13 or 14 fathoms, at about 3 miles within the barrier, the water there not being so deep, and the bottom less likely to foul an anchor than would be the case nearer the reefs.

* See Admiralty chart of Australia, East coast, Sheet xx., No. 2,324; scale, $m=0\cdot25$ of an inch.

The 100-fathoms edge of the bank of soundings extends about 16 miles to the north-eastward from the spit of the reef just mentioned, to a very projecting elbow of the barrier in lat. $11^{\circ} 32' S.$, long. $144^{\circ} 5' E.$, the intermediate space forming the entrance of Blackwood channel, which is the broadest opening yet discovered through the Barrier reefs.

GREAT DETACHED REEF.—This remarkable detached reef, on reference to the chart, has the imaginary appearance of having originally formed that part of the Great Barrier now only represented by the 100-fathoms line, extending across the entrance of Blackwood channel, and as if thrust out to the south-eastward from its proper position, by some violent effort of nature, leaving the channel between the western side of the Great detached reef and the edge of the bank of soundings, from 3 to 4 miles wide, in which no bottom could be found with 150 fathoms of line.

The Great detached reef is of irregular form, $12\frac{1}{2}$ miles long, S.E. by S. and N.W. by N., and $3\frac{1}{2}$ miles broad, except at its centre, where an elbow projects nearly 4 miles from the eastern side of the reef, its outer extreme being in lat. $11^{\circ} 44' 30'' S.$, long. $144^{\circ} 7' E.$: from this point the south-eastern extreme of the reef bears S. $\frac{3}{4}$ W. $5\frac{3}{4}$ miles, and the northern end N.W. by W. $8\frac{1}{2}$ miles.

The northern portion of the west side of the Great detached reef, for 8 miles, is only defined by a 100-fathoms line of soundings, with a greater number of patches and mushroom heads of coral along its edge than are shewn in the chart; the other limits of the reef consist of a continuous barrier, showing numerous rocks dry at low water,* on the eastern side, with only three small openings, one on the west side, at $2\frac{1}{2}$ miles from the south-western extreme, and the other two, which are close together, midway between the eastern and northern extremes of the reef; the former opening has not been sounded, but the two latter are safe, though narrow channels.

Two small detached reefs lie $4\frac{1}{2}$ miles to the north-westward from the south-west extreme of the Great detached reef, the western being of an oval, and the other of triangular shape.

The interior of the Great detached reef forms a good harbour, with sheltered anchorage in from 18 to 20 fathoms, all over its northern part; also in the eastern bight in 8 fathoms, but the coral mushroom heads here are numerous, and require great caution. The broadest entrance is at the north-west end, but as a sailing vessel would there have to beat in against the south-east monsoon, a quicker way of entering would be found through one of the narrow openings already described, on the north-east side;

* In 1858 the wreck of the ship *Chesterholme* was reported to have been seen lying on the Great detached reef, but the position of the wreck was not given.

although they are very narrow, the *Bramble*, drawing nearly 14 feet, had no difficulty in running in through the eastern of the two openings.

RAINE ISLAND, which may easily be known by the beacon tower built on it, is situated in the centre of the opening between the northern extreme of the Great detached reef and the projecting point of the barrier reef, N.E. by N. $8\frac{1}{2}$ miles from it; there is a clear channel on either side of the island; the southern being $3\frac{1}{2}$ miles and the northern nearly 2 miles broad.*

Raine island is one-third of a mile long, nearly one quarter of a mile broad, and 20 feet above the level of the sea at low water. The lower stratum consists of a coarse coral sand-stone rock, with a thick covering of rich vegetable and guano soil; it is surrounded by a coral reef, closely fringing the north-west end, but extending $1\frac{1}{4}$ miles from the south-east extreme of the island; this reef is in most parts dry at low water, and entirely so at springs.

As no bottom could be reached with 125 fathoms, in any part of this opening, nor close up to the lee of Raine island, it affords no anchorage; although a small vessel might drop an anchor on a narrow shelf of the reef, on the north-west side of the island, and veer out with a hawser, into the deep-water; this is not, however, a measure to be recommended, as the ebb stream would be likely to sweep her, broadside on, against the reef. It need hardly be observed that the best landing-place is on the north-west side of the island.



Raine island Beacon, 1844.

BEACON. — Raine island, formerly being an important point in the navigation of Torres strait, by the Outer route through the Coral sea, from the Australian colonies, it was considered by Captain F. P. Blackwood the most eligible site for a sea mark. A substantial beacon was accordingly erected in 1844, under his direction, on the south-east point, by the crews of the *Fly* and *Bramble*, assisted by the Government of New South Wales.

The beacon is a circular tower, built of stone, quarried on the island; it consists of a series of chambers, one above the other, communicating with

* See sketch of Raine island on Admiralty chart of Australia, East coast, Sheet xx., No. 2,354.

each other originally by ladders, and was surmounted by a wooden dome, with a ball on the top; the height of the whole was 64 feet, or 74 feet above low water mark, and the tower 30 feet in diameter at the base. It was painted with alternate red and black vertical stripes; the beacon in clear weather was then visible 8 or 9 miles from the deck.*

Raine island beacon was inspected by Captain Denham in March 1860, when the dome had decayed and fallen; but it still presented a substantial tower, needing no restoration to adapt it to a lighthouse, if one should be required on Raine island. The tower, without the dome, was 60 feet high, and should be visible in clear weather, at the distance of about 8 miles.

Supplies.—An ample supply of provisions used formerly from time to time, to be lodged in the chambers of the beacon, for the relief of shipwrecked, or other distressed persons.

The tank has since become completely worn out, and no provisions are to be obtained (1874).

Raine island produces a bushy sort of plant, coarse grass, and a desirable kind of vegetable resembling spinach, for which it has proved a very welcome substitute. Sea birds are incredibly numerous, and the eggs of the tern, quite equal in flavour to those of the domestic fowl, may be gathered in great abundance, at certain seasons of the year. Turtle also frequent the island to deposit their eggs.

The guano found on the island, lies in patches and is from 3 to 6 inches deep.†

TIDES.—It is high water, full and change, at Raine island, at 8h. 10m. by the shore, and an hour and three-quarters later in the stream; springs rise 10 feet. The strength of the stream sometimes exceeds 2 knots, the flood coming from the eastward; there is also, generally, a current setting one knot to the northward, along the face of the Barrier, and to the north-west through Raine island entrance, during the prevailing south-east winds. Neap tides are, at times, scarcely perceptible, and there are many irregularities with respect to the stream and its velocity; for all the purposes of navigation 9h. 30m. or 10h. at full and change, may be considered the time at which the flood ceases, and it becomes slack water: the flood running on an average 7 hours to the westward, and the ebb 5 hours to the eastward.

REMARKS.—A vessel proceeding to Torres strait from the Outer route, and intending to enter the Great Barrier reefs by Raine island, or by either of the adjacent openings, should be certain of her latitude, and if running in for Raine island, should shape her course so as to make the

* The beacon not having been painted since its erection, has become whitened by exposure, and is difficult to make out in hazy weather.

† Remark book, Commander J. Carnegie, H.M.S. *Salamanca*, 1865.

beacon well on the starboard-bow in order to allow for the northerly current. When the beacon is clearly made out, the island will soon be seen, and may be passed on either side, both passages, north and south of the island, being clear and easily navigated, and for which the necessary directions will be given at page 454.

BLACKWOOD CHANNEL.—The depth of water across the entrance of this channel, just within the edge of the bank of soundings, is very irregular, varying from 95 to 5 fathoms, and so studded with sunken coral patches, that there is scarcely a clear passage more than three-quarters of a mile broad between any of them. But as few of these patches have less than 3 fathoms water on them, and as they are very easily distinguished from aloft, when the sun is not ahead, by the tide rippings and the pale greenish colour of the water, in striking contrast with the dark blue around them, there is no difficulty whatever in passing through these dangers, if a good look-out be kept.

Although the entrance of Blackwood channel is 16 miles broad between the points of the Barrier reefs, about 7 or 8 miles only on its south-western side, where it is partially protected by the Great detached reef, can be considered safe navigable water; the heavy rollers, which break with great violence upon the numerous detached reefs and coral patches scattered over the north-eastern and more exposed portion of this opening, being alone quite sufficient to deter any person from attempting a passage in that direction.

A small sand-bank, nearly awash at high water, with a coral patch at about a mile to the eastward of it, upon which the sea generally breaks heavily, lies about N. by W. $\frac{1}{4}$ W. 6 miles from the south-western extreme of the opening. There is a larger sand-bank $2\frac{1}{2}$ miles to the north-westward of the former, situated on the north-west extreme of a detached reef, one mile long, with a clear passage $1\frac{1}{2}$ miles broad between them.

Another deep, clear channel, $1\frac{1}{2}$ miles broad, passes to the northward of the latter sand-bank, bounded to the north-eastward, by a series of scattered reefs, which extend northward to a third sand-bank, North 5 miles from that last described. The next reefs to the eastward, again assume the character of a continuous barrier, from 3 to 4 miles within the edge of the bank of soundings, and extend to the projecting elbow of the barrier, forming the north-eastern extreme of this broad opening.

Blackwood channel, from its entrance to Sir Charles Hardy islands and Cockburn reef, is about 28 miles long, and passes between Ashmore and Middle banks, where the least breadth of the channel is nearly 6 miles.

ASHMORE BANKS, on the south side of Blackwood channel, are two bare sand-banks, midway between the Great Barrier reefs and Sir Charles Hardy islands. They are about 8 feet above the level of the

sea, and $2\frac{1}{2}$ miles apart, bearing E. $\frac{1}{2}$ N. and W. $\frac{1}{2}$ S. from each other. The western bank is 9 miles E. by N. northerly from the north point of the north-western Sir Charles Hardy islands: each is surrounded by a reef about $1\frac{1}{2}$ miles in circumference.

Another, but less elevated bank lies S.S.E. $2\frac{1}{2}$ miles from the eastern of the two just described, and is also encircled by a small coral reef.

A sunken coral rock lies W. $\frac{1}{2}$ N. 3 miles from the latter bank, which like the reefs surrounding all the Ashmore banks, is steep-to; and there are deep channels between them.

H.M.S. *Barracouta* went over a small rocky shoal with about 4 fathoms, or less, water on it, bearing S.W. by S. distant 2 miles from Ashmore west bank; and at S.W. $\frac{1}{2}$ W. 2 miles from the same Ashmore bank, she passed two black rocks with from 4 to 5 fathoms on them.

Ashmore banks are good marks for vessels passing from the different openings through the Barrier reefs to the inner route, by either of the channels to the northward of Sir Charles Hardy islands.*

MIDDLE BANKS, on the north side of Blackwood channel, are four small shifting sand-banks covered at half tide. The westernmost is the largest and most conspicuous; it is surrounded by a narrow fringe of coral, and lies N.E. $11\frac{1}{4}$ miles from the north-western Sir Charles Hardy island; a small coral patch under water, with a spot of 3 fathoms a little southward of it, lies three-quarters of a mile S.W. $\frac{3}{4}$ W. of the sand bank; there is also shallow water between the 3 fathoms and the Tynemouth bank.

The next bank of this cluster, $1\frac{1}{4}$ miles to the north-eastward of that just described, is situated on the northern edge of a series of small detached reefs, on which the sea breaks; the reef is 2 miles long E.N.E. and W.S.W., and will be first seen in the event of a vessel being set to leeward by the flood stream or current. when passing through Blackwood channel; the reef is bold on its southern side, and close to the northward of it, are the two other Middle banks, lying near each other, each encircled by a small detached reef.

A small coral patch, on which H.M.S. *Salamander* struck in 1865, lies one mile E. by S. $\frac{1}{2}$ S. from the east extreme of Middle banks reef; it is very narrow, about 230 yards long East and West, and has a depth of only 6 feet, with 10 to 17 fathoms all round, and from 15 to 17 fathoms in the channel between it and Middle banks reef. From the patch the south-east Middle bank bears W. $\frac{3}{4}$ N. $2\frac{1}{4}$ miles distant, and the peak of the north-west Sir Charles Hardy island S.W. by W. $14\frac{1}{4}$ miles.

* Staff Commander T. H. Tizard, H.M.S. *Challenger*, 1874, remarks: The Ashmore banks, and Sir Charles Hardy islands, do not appear relatively correct on the chart.

TYNEMOUTH BANK, N.N.E. $\frac{1}{2}$ E. $8\frac{1}{4}$ miles from the north-western Sir Charles Hardy island, was discovered by the steam ship *Tynemouth* in August 1858, and is reported as a dangerous coral patch apparently about 100 yards in extent, with its centre nearly awash at low water. In H.M.S. *Herald's* passage from Raine island westward for Torres strait, in 1860, this bank was not seen in the position assigned to it; a vigilant look-out should therefore be kept.

The soundings in Blackwood channel are generally regular, the average depth being about 15 fathoms sand. But between the Middle banks and Sir Charles Hardy islands is a remarkable hollow, with depths of 36 fathoms, and on its edge, 6 to 12 fathoms.

A vessel may pass north of the Middle banks, taking care to look out for a small rock, covered at half tide, at a mile to the north-westward of the northernmost of these banks, and also for Tynemouth bank.

The TIDES in Blackwood channel were found to be irregular, the floods setting to the westward, and the ebb E.N.E., from $1\frac{1}{2}$ to 2 knots at springs: independently of the tide stream, one knot per hour may not be too much to allow for a northerly set, during the prevalence of the south-east monsoon.

Directions for Blackwood channel are given at page 454.

Middle Passage.—H.M.S. *Fly* groped her way from Blackwood channel to mount Adolphus by this route, passing close to the westward of Middle banks, and steering nearly N.N.W. for the first 30 miles, and afterwards keeping away gradually more to the westward. This passage is from 10 to 15 miles shorter in actual distance, than through the North and Pollard channels and the Inner route; but it is on no account to be recommended, its south-eastern, and greater portion being so full of reefs and sunken coral patches, without any object above water to serve as a land-mark or beacon to guide the navigator.

DIRECTIONS.—Should the Middle passage however be attempted, the chart will give the best idea of the ground to be got over; and to be prepared for the numerous dangers in the route, the vessel must be kept under easy, but commanding sail; there must be a good look-out from aloft, a boat ahead in suspicious water, an anchor always ready to let go, and on no account should the vessel be run in the glare of the sun, when it is ahead. These precautions should always be borne in mind whilst navigating amongst coral reefs and sunken patches.

PANDORA ENTRANCE.—From the projecting point of the barrier, 5 miles to the north-eastward of Raine island, the Great Barrier reefs trend to the north-westward 7 miles, terminating at a vegetated sand-bank forming the south-east side of Pandora entrance, through which

H.M.S. *Pandora* passed in 1791; this sand-bank, which lies in lat. $11^{\circ} 26' 30''$ S., long. $144^{\circ} 1' 30''$ E., is nearly half a mile long. S.E. and N.W., and about 6 or 7 feet above high water.

Pandora entrance is $2\frac{1}{2}$ miles broad S.E. and N.W., and has a depth of 20 to 40 fathoms in it. Several detached reefs lie across this opening, at about 2 miles within the entrance, but there is a clear passage, one mile wide, through this inner line of reefs, with the sand-bank bearing N.E.

The space within the entrance has not been closely sounded, but it appears tolerably clear of reefs for 10 or 12 miles to the westward, when a chain of sand-banks, each surrounded by a reef, extends nearly 10 miles North and South. The northernmost and largest bank, which is slightly vegetated, lies N.W. by W. $\frac{1}{4}$ W. 13 miles from Pandora entrance. Between this bank and the reef next to the southward of it, on which are two small sand-banks, is a clear passage 2 miles broad, and between them and the third bank is a second clear passage, nearly one mile wide.

DIRECTIONS.—The large sand-bank on the south-east side of Pandora entrance being clearly made out, round it at a distance of about half a mile, and then steer S.W. by S. running through the passage with the sand-bank bearing N.E., the depths will then be from 20 to 13 fathoms; when well clear of the inner line of reefs, steer north-westward for the northernmost, or vegetated sand-bank, just described, and from thence a nearly direct N.W. by W. $\frac{1}{4}$ W. course, may be shaped for mount Adolphus. This route appears more free from reefs and sunken patches than the Middle passage, but it must be navigated with equal caution.

There is well-sheltered anchorage in 11 or 12 fathoms, coral and sand, under the lee of the barrier on the south-east side of Pandora entrance, at about a mile to the south-westward of the sand-bank. Should a vessel enter late in the day, she will do well to anchor here, rather than push on through uncertain and dangerous waters, with approaching night.

Although Pandora entrance is not a channel to be specially selected, its leeward position renders it a very valuable opening for a vessel to run for, when from error in reckoning, or from strength of current, she is found too far to leeward to enter by either Raine island, or the other passages to the southward. See page 456.

The BARRIER from Pandora entrance, consisting of a series of detached reefs overlapping each other and appearing at a little distance as continuous, trends about N.E. by N. 11 miles, when it suddenly projects $1\frac{1}{2}$ miles to the eastward, ending in a point which forms the south side of Olinda entrance, in lat. $11^{\circ} 15'$ S., long. $144^{\circ} 6' 30''$ E.

OLINDA ENTRANCE, $1\frac{1}{2}$ miles broad, is the northernmost opening in the Barrier reefs near Raine island passage; it is well marked by the continuous reef north of it, but this entrance cannot be recommended unless

ships are very far to leeward. There are several shoals within the entrance, which render it dangerous, more particularly as it has not been sounded.*

In entering, the reefs on the north side of the entrance should be kept close on board on the starboard hand; with a good look-out from the mast-head, a ship can safely enter any time before noon, after which the sun will be too far a-head.

At about midway between Pandora and Olinda entrances is an opening nearly three-quarters of a mile broad, which the *Oriental* is supposed to have entered in 1840; but this passage is not recommended, in consequence of the numerous detached reefs scattered along inside the barrier, between Pandora and Olinda entrances, upon which the sea generally breaks with violence.

From Olinda entrance, the outer edge of the Great Barrier reefs takes nearly a N.N.W. direction for 35 miles to lat. $10^{\circ} 40'$ S., or about the parallel of cape York, the reefs varying in breadth from half a mile to $4\frac{1}{2}$ miles, the inner edges of the broadest parts terminating in points extending to the westward. This portion of the reefs may be considered an impenetrable barrier, as it is not intersected by any passage, fit even for the smallest vessel to take. There appears to be deep water close within the inner edges of the reefs; but farther to the westward it is almost unexamined, and may be looked upon as dangerous navigation.

* H.M.S. *Salamander* in 1866, crossed the reef from port Albany to Olinda entrance, which she passed through.

CHAPTER VI.

TORRES STRAIT, INCLUDING THE WESTERN CHANNELS.—THE
NORTHERN TERMINATION OF THE GREAT BARRIER REEFS
AND THE GREAT NORTH-EAST CHANNEL.

VARIATION in 1879.

Prince of Wales island	-	-	4° 40' E.		Bramble cay	-	-	5° 05' E.
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THE description of the east coast of Australia, to its northern termination at cape York, having been completed, the present chapter will describe Torres strait, with its numerous channels, islands, and reefs, between the Coral and Timor seas.

PEAK POINT, over which is Peaked hill, 550 feet high, is the north-west extreme of York peninsula, and the south-east point of the eastern entrance to Endeavour strait; it bears W. by S. $\frac{1}{4}$ S. nearly 6 miles from cape York.*

The COAST between cape York and Peak point is low, and forms a shallow bay, with a continuous sandy beach, except where broken by a bluff point, W.S.W. $1\frac{1}{2}$ miles from the cape. There is a rock above water, close to the east side of the point, and two others lie nearly $1\frac{1}{2}$ miles to the westward of it. A wooded coast range of moderate height, rises from the low land behind the beach, and extends from mount Bremer to Peaked hill.

There is not sufficient depth of water in the bay, even for small vessels, as a shallow flat extends from the shore, nearly half a mile beyond a line between the two extreme points of the bay.

a. ROCK, N. by W. $\frac{1}{4}$ W. $4\frac{1}{2}$ miles from cape York, is a small rocky islet, visible at a distance of 8 or 9 miles from a vessel's deck; it may be passed at the distance of half a mile on either side, and it is an excellent mark for making Prince of Wales channel.

ENDEAVOUR STRAIT is the southernmost and most extensive of the western channels of Torres strait; but it is not to be preferred, on account of the numerous dangerous sunken patches in it.

* See Admiralty charts, Torres strait: Sheet 1, Western channels, No. 2,375; scale $m = 0\cdot5$ of an inch; and Coral sea and Great Barrier reefs of Australia, Sheet 2, No. 2,764; scale, $m = 0\cdot04$ of an inch.

The eastern entrance of the strait, which is easily recognized by the group of islands lying in it, is 9 miles broad, East and West, between Peak point and Rattlesnake point, the eastern extreme of Prince of Wales island.

There are no settled inhabitants on the islands lying in the eastern entrance of Endeavour strait; but they are frequently visited by the natives of the adjacent islands and mainland.

POSSESSION ISLAND, the largest of the group just mentioned, is nearly 3 miles long, N.N.E. and S.S.W., and half a mile to three-quarters of a mile broad; its north-east point lying 2 miles W. $\frac{1}{2}$ S. of Peak point. The island is remarkable for the number of round hills on it, between which the land is low and woody, producing a coarse kind of grass. Small quantities of water may sometimes be found, but none was seen when sought for by a party from H.M.S. *Bramble*, in August 1848. A small rock above water lies close to the north-east end, and a narrow shoal near the south-west point of the island. Several dangerous patches of coral lie off the west side of the island, the farthest from the shore being distant about half a mile.

The channel which separates Possession island from Peak point, is about one mile broad, with from 2 to 4 fathoms water; but it is too intricate and full of shoals to be available, even for coasting vessels. Nearly in the middle of this channel, at $1\frac{1}{2}$ miles to the south-westward of Peak point, is High island, between which and the point are two rocks above water; a shoal-spit runs out one quarter of a mile from the south end of the island.

Two low islets, surrounded by a shoal, lie from three-quarters of a mile to $1\frac{1}{2}$ miles to the southward of High island; at half a mile to the south-eastward of the island, is a smaller one, on the north end of a narrow shoal, one mile long, running parallel with, and close to the shore of the mainland.

Dayman Island, at about one mile to the south-westward of Possession island, is nearly one mile long, and is high and mostly barren, having only a few stunted trees. Some sunken rocks lie close off its northern point; but every other part of the island may be approached in 5 to 8 fathoms, to the distance of one quarter of a mile.

Nearly midway between Dayman island and the mainland are three islets and a rock above water, lying near each other, and surrounded by shoals. Simpson bay—the space between these islets and the mainland—is too shallow for vessels to enter; but anchorage in from 4 to 6 fathoms, may be found between the islets and Dayman island, with less strength of tide than is experienced outside the island.

Meddler Island, about three-quarters of a mile to the north-

westward of Possession island, is small, high, and partially wooded; foul ground, extending one quarter of a mile off shore, skirts its northern side, but to the southward the island is bold to approach.

At one mile to the south-westward of Meddler island is Quoin islet, barren, rocky, and of a quoin-like shape; some sunken rocks lie close to its north and south ends, but the islet may be passed at one quarter of a mile off either side. Midway between the islet and Meddler island is a dangerous coral patch, with 2 fathoms water on it.

The channel between these two isles and Possession island is about half a mile broad, it being contracted by the coral patches off the western side of Possession island; as the tide streams generally run through with great velocity, more than ordinary care is requisite in taking large vessels through this channel.

WOODY ISLANDS.—Great Woody isle, W. by S. $1\frac{1}{4}$ miles from Meddler island, is three-quarters of a mile long, and one quarter of a mile broad; it rises to a ridge, and is, as its name implies, covered with wood. A small 3-fathoms patch of coral lies half a mile off its north-east end, and a reef runs out one-third of a mile from its south-west point, nearly joining Little Woody island, which is much smaller, but similar in aspect to the island just described. Little Woody island has also a coral spit projecting from its south-west point, and a smaller spit, with 3 fathoms water, from its northern extreme.

The channel between Woody islands and Meddler and the quoin-shaped islet is nearly one mile wide, with 7 and 8 fathoms water; but the tide streams run through with great strength, and in the same direction as in the channel immediately to the eastward.

HEROINE ROCK and GIBSON SHOAL.—Heroine rock is a small and dangerous coral patch, rising abruptly from a depth of 8 fathoms, to within 3 feet of the surface of the sea at low water; from this rock Dayman island bears E. by N. $2\frac{1}{4}$ miles, and Little Woody island N. by E. $\frac{1}{2}$ E. $3\frac{1}{4}$ miles. At about $1\frac{1}{2}$ miles to the north-westward of Heroine rock, a shoal is reported to exist, on which the ship *Gibson* struck in 1853; but its position is very doubtful.

TIDES.—It is high water, full and change, at Possession island at 1h.; the rise at springs being $9\frac{1}{2}$ feet; the flood sets to the S.S.W. 7 hours and the ebb to the N.N.E. 5 hours; at springs the former has been known to run 5 and the latter $3\frac{1}{2}$ knots.

The COAST.—From Peak point a low sandy shore, slightly curving to the south-eastward, takes a south-westerly direction for 17 miles to Mootee headland, 200 feet high and very conspicuous; nearly 3 miles beyond is the entrance to the Jardine river. The coast is backed by

low hills, with woody flats behind them, and has a continuous sandy beach in front.

The coast to the westward of Jardine river continues low and sandy, and takes a more southerly direction for 6 miles, to a shallow opening, $1\frac{1}{4}$ miles broad, with a flat wooded island, or broad projecting point of the mainland, on its western side, forming the turning point into the gulf of Carpentaria.

The interior country between Peaked hill and this bend of the coast line is low, undulating, and well wooded, with numerous salt-water creeks.

JARDINE RIVER, the entrance to which is half a mile wide, is about 60 miles in length, and rises on the east coast near Pudding Pan hill. It is subject to heavy floods during the N.W. monsoon (December to March), but when visited in the S.E. monsoon in 1866 it had an average depth of 4 feet above the tidal influence. Boats can only enter at half tide, as at low water the sand washed down by the stream forms numerous shifting bars, with not more than one foot water on them, for 3 miles inside the entrance.

Water.—At low tide the river is fresh close within the east side of the entrance, where boats can fill from alongside.

Anchorage.—There is good anchorage in 6 fathoms close to the sand-spit running off the east side of the entrance, with the end of the spit bearing from South to S.W.

Brady bank is a narrow shoal, nearly 3 miles long, N.N.E. and S.S.W. on the north-eastern end of which is a small islet, about a mile to the southward of Dayman island. The central part of the bank dries at low water, and the western side, which is steep-to, may be approached in 6 and 7 fathoms water, to the distance of half a mile.

The space between Brady bank and the mainland has not been sounded, but it appeared very shallow. An islet lies about midway, the position of which is doubtful.

Red Island, S. $\frac{1}{2}$ W. nearly $4\frac{1}{2}$ miles from Dayman island, and one third of a mile from the mainland, is about three-quarters of a mile long, and rises to a hill of a reddish colour at its western end. Two small islets lie half a mile outside the island, on the western edge of a shoal extending $3\frac{1}{2}$ miles to the south-westward from Red island; the shoal is steep-to, except about its south-west extreme, where are some shallow knolls.

Between the shoal extending to the south-westward from Red island and Mootee headland, the coast may be safely approached in depths of 6 to 8 fathoms, to the distance of a mile, but between the headland and Jardine river the 3-fathoms line extends three-quarters of a mile from the shore. The sands inside the river shift with the tide, but there is no bar outside.

From the river to the western termination of the coast described, shoals gradually extend from half a mile to $2\frac{1}{2}$ miles from the shore. Two small detached knolls lie off these banks, the eastern N.W. by W. $\frac{1}{2}$ W. $1\frac{1}{2}$ miles, and the other, West $4\frac{1}{2}$ miles from the river; the former has $3\frac{1}{2}$ fathoms, and the latter 2 fathoms water on it.

Barn Island, $2\frac{1}{4}$ miles to the westward of Red island, is small and high, enclosed by a reef, and covered with stunted trees and scrub; it rises to a sharp ridge, and resembles the sort of building from which it derives its name. There is a clear channel, $1\frac{1}{4}$ miles wide, between Barn island and the edge of the shoal outside the Red isles.

WOODY WALLIS ISLAND, W. by S. $\frac{1}{4}$ S. 17 miles from Barn island, is about a mile in circumference, and rises in the centre to a hill about 40 feet high; the island is partially wooded, and produces a coarse kind of grass. A sandy spit juts out from the north end, affording a convenient landing place. The coral reef which surrounds the island is about $1\frac{1}{2}$ miles long, the greater portion extending to the westward, from whence the Wallis banks continue $4\frac{1}{2}$ miles farther in the same direction. Shoal water also extends $1\frac{1}{2}$ miles to the eastward from the island.

INSKIP BANKS are extensive shoals of sand with veins of deep water between them, occupying the space between Woody Wallis island and the mainland. On the east end of the northern bank, on which is only one fathom, is a small rock, awash at low water, bearing S.S.E. $\frac{1}{4}$ E. one mile from the south part of Woody Wallis island. These banks were closely sounded by Lieutenant C. B. Yule in 1848, with a view of ascertaining if any available channel existed leading out to the westward, but he could find none.

RED WALLIS ISLAND, N. by W. $\frac{3}{4}$ W. 2 miles from Woody Wallis island, is small, rocky, and from 50 to 60 feet high; it is flat-topped, and covered with stunted vegetation, having a reddish appearance at a distance. The island and a rock above water near its east side, are surrounded by a circular reef three-quarters of a mile in diameter. Three spits project from this reef, one to the north-eastward, one mile, another E.S.E. three-quarters of a mile, and the third, on which is a rock above water, S.S.W., three-quarters of a mile from the island.

RED BANKS form a narrow shoal stretching $6\frac{1}{2}$ miles to the westward from Red Wallis island, between which and Wallis banks are several knolls and covered sand-banks, extending upwards of 7 miles to the westward; these, together with the Wallis and Inskip banks and the shoals described to the southward, apparently show that there is no safe channel to the westward from Endeavour strait, between Red Wallis island and the mainland.

TIDES.—At the Wallis islands the tides are very irregular; the rise is 7 feet, and the greatest velocity observed was 2 knots: at times it was noticed that there was high water only once in 24 hours.

The **NORTH SIDE of ENDEAVOUR STRAIT** is formed by Entrance island and the southern coast of Prince of Wales island, from Rattlesnake point to cape Cornwall, and the southern edge of Rothsay banks projecting to the westward from the island.

ENTRANCE ISLAND, on the west side of the eastern entrance of Endeavour strait, is high and barren, and separated from Rattlesnake point by a channel about two-thirds of a mile across, with from 4 to 10 fathoms water. The island is 2 miles long, North and South, and nearly one mile broad. Foul ground extends nearly one quarter of a mile from its northern point, and a small islet, enclosed by a coral reef, lies one third of a mile off its south-west extreme, with foul ground extending nearly a mile still farther in the same direction. The eastern side of the island is bold, and may be passed within one third of a mile.

The channel between Entrance island and Woody islands is the broadest and best leading into Endeavour strait from the eastward.

CAPE CORNWALL, the south extreme of Prince of Wales island, *see* page 331, is surmounted by a round hillock, bearing S.W. by W. $\frac{1}{4}$ W. $6\frac{1}{2}$ miles from Rattlesnake point. The intermediate coast consists of rocky points and shallow bays. Midway between Rattlesnake point and cape Cornwall is Packe island, which is small and high, and lies near the shore. Turtle islet, and three rocks above water, lie between Entrance and Packe islands.

Port Lihou is a shallow bay immediately to the westward of Packe island; but it is too exposed and full of shoals to be worthy of notice.

A small islet, on which are some high trees, lies S.S.W. $1\frac{1}{2}$ miles from Packe island; it is situated on the southern edge of foul ground, extending nearly the whole distance from Entrance island to cape Cornwall. Three dangerous coral patches, with from one to 3 fathoms water on them, lie off the islet, the first bearing E. by S., nearly 2 miles; the second (Eagle rock) S.E. $\frac{1}{4}$ E., $1\frac{1}{2}$ miles; and the third South, nearly 2 miles distant; a fourth shoal lies S. by E., one mile from Eagle rock, and the least depth found upon it appears to have been 5 fathoms.

From Yule point, a bold headland $1\frac{1}{2}$ miles to the westward of cape Cornwall, the western coast of Prince of Wales island, consisting of steep rugged bluffs and small bays trends north-westward $3\frac{1}{2}$ miles, to Bampfield head, and from thence about the same distance N. $\frac{1}{4}$ W., to a point, close off which is N.W. islet.

Caution.—Although the water is deep between these dangers, others

may yet remain undiscovered, and as the shoals and foul ground between Entrance island and cape Cornwall front—what may be considered during the greater part of the year—a lee shore, affording no inducement for a vessel to approach it, she should, in passing through Endeavour strait, keep well to the southward of the above dangers.

ROTHSAY BANKS are a mass of covered sand-banks and knolls, extending in a W.S.W. direction 13 miles from the western coast of Prince of Wales island, between Yule point and N.W. islet; the general trend of the southern edge, which is mostly steep-to, is nearly W. by S. 16 miles from cape Cornwall, and it terminates in knolls, with 2 and 3 fathoms water on them. The most shallow part, with 9 feet on it, lies about midway between Bampfild head and the westernmost extreme of the shoals; the average depth of Rothsay banks being about 3 fathoms.

Many vessels have crossed Rothsay banks, and those not drawing more than 10 feet may do so in some parts with safety, when the water is smooth; but there is some risk attending it, in consequence of the shifting nature of the sands.

The best channel, and indeed the only one to be recommended through the western entrance of Endeavour strait, is between Rothsay and Red banks; but even this is not free from dangers, as several shoals, on one of which is only 2 fathoms water, lie in mid-channel to the westward.

The **SOUNDINGS** in Endeavour strait are generally regular, the average depth being about 8 fathoms, coral and sand; but it is proper to remark that, in the midst of deep water, small coral patches are frequently met with, which are most easily detected by a good mast-head look-out, when, if the rocks themselves are not visible, the tide rippings over them will in most cases point out these hidden dangers.

The tide streams in Endeavour strait generally follow the direction of the channels, the flood setting to the westward, and the ebb to the eastward.

DIRECTIONS.—A vessel from the eastward, proceeding through Endeavour strait, having passed Mid rock, between mount Adolphus and cape York, and opened Peaked hill, to the northward of York island, should steer W. by S., so as to pass at about one mile outside that island from whence a continuation of the same course for 11 miles farther will lead to the entrance of the strait, between Woody islands and Entrance island, passing about one mile to the northward of Meddler and Great Woody island; in rounding the latter, care must be taken to avoid the 3-fathoms shoal lying half a mile off the north-east point of the island.

Although there are several passages into Endeavour strait from the eastward, that between Woody and Entrance islands is by far the best, it being broader and deeper than the others, with less strength of tide. The passage between Meddler and Possession islands is, however, by some

preferred, as there are no mid-channel dangers after passing, and the tides, although strong, set straight through.

When abreast of the channel between Woody and Entrance islands, steer S.W. by S. through it, passing Pym point, the south-east extreme of Entrance island, as near as circumstances will permit, to avoid Gibson shoal; continue this course, making due allowance for strong tide streams, until Barn island bears E. by S. $\frac{1}{2}$ S., then alter course to W. $\frac{1}{2}$ S., passing at about $2\frac{1}{2}$ miles to the northward of Red Wallis island; by carefully pursuing this course 8 miles farther it will lead clear out into the Arafura sea, closely skirting the southern edge of Rothsay banks. The bottom here being sand the shoals are not so easily distinguished as coral, it will therefore be necessary to pay great attention to the lead to avoid the banks and knolls lying between the western extremes of Rothsay and Red banks, especially one with only 2 fathoms on it at low water, W. by N. $7\frac{3}{4}$ miles from Red Wallis island; it is recommended to steer to the northward of this knoll, to keep clear of others to the southward of it, and the 2 fathoms termination of Red banks, lying West $6\frac{1}{2}$ miles from Red Wallis island.

Vessels not drawing more than 10 feet, as already remarked, may, when the water is smooth, cross Rothsay banks, in 3 fathoms water, north-westward towards Booby island, by keeping the two Wallis islands in line.

Small vessels bound to the gulf of Carpentaria from the eastward, when in mid-channel, between Possession and Meddler islands, should steer S.S.W. $\frac{1}{2}$ W. $3\frac{1}{2}$ miles, when they will be nearly a mile to the westward of Dayman island; and thence 7 miles on a S.W. $\frac{1}{2}$ S. course will take them about $2\frac{1}{2}$ miles to the westward of Barn island, with the south end of Red island open to the southward of it. Be careful to pass to the eastward of the Heroine rock, which may be ensured by keeping Meddler island open to the eastward of Quoin islet. When Red island is open to the southward of Barn island, steer W. by S. $\frac{1}{2}$ S. for Woody Wallis island, 15 miles off, and when near it, steer so as to pass half a mile to the south-west of the island, which will be a midway course between it and the rock awash at low water, on the one fathom bank to the southward, *see* Inskip banks page 327. Then steer W. by S., keeping on the Woody Wallis side of the channel for about 3 miles, until that island bears N.E. by E. $\frac{1}{2}$ E., and Red Wallis N.N.E.; and thence S.W., crossing over sundry banks of 4 fathoms with 8 fathoms between, hard sand, until the soft bottom of the gulf is reached; but until then keep a good look out for shoal water, heaving the lead constantly, as unknown knolls of sands may exist, the ground on the west side of Inskip banks not having been surveyed.

From the Westward.—During the north-west moonsoon the

sea often breaks upon the western extremes of Rothsay and Red banks and the knolls between them, but as they lie too far from the land to afford any good guiding mark to make them from the westward—Red Wallis island not being visible beyond the distance of 8 or 9 miles—Endeavour strait is not to be recommended as a desirable passage for vessels proceeding to the eastward through Torres strait; and from the numerous reports of new dangers having been discovered, even since Endeavour strait was re-sounded by Lieutenant C. B. Yule in 1848, all vessels bound through Torres strait eastward or westward, will find Prince of Wales channel far more safe, expeditious, and easy to navigate. See page 341.

PRINCE OF WALES ISLAND (native name *Moorlug*), the southern portion of which has just been described with Endeavour strait, see page 328, is the largest island in Torres strait, it being 11 miles long North and South, and 10 miles broad.

From Rattlesnake point the north-east coast of the island, which is skirted by a narrow reef and backed by a steep ridge of hills, trends N.W. by N. 4 miles, to Red point, and then becomes low and woody, still fronted by a narrow coral reef, and continuing 4 miles farther in a north-westerly direction to Heath point, the north extreme of the island.

From Heath point to N.W. islet the north-western coast consists of rocky points and small bays, with wooded valleys between the ridges of hills descending to the shore from the interior. This side of the island is difficult of access on account of the numerous shoals and sand-banks bordering the shore.

The interior of Prince of Wales island is high and rocky, but as it has yet remained unexplored, little is known of its productions or capabilities, although it seemed in many parts well wooded, with a fair proportion of good soil, and signs of fresh water in a bay on the north-west side. This appears to be the only island of the immediate neighbourhood permanently inhabited, as this is, on the southern side, although all the islands are continually visited by the natives.

HORN ISLAND (*Narōpai*), immediately to the north-eastward of Prince of Wales island, derives its name from a remarkable double peak, 430 feet high, on its east side. The island is nearly circular and 15 miles in circumference. The eastern coast rises to a range of apparently barren hills, which continues from the south-east extreme of the island north-westward to Double hill, near its north-west extreme. The other shores of Horn island are low and wooded; there is also a considerable tract of low land at the back of Horned hill, which appeared to be barren.

Horn island is entirely surrounded by a narrow fringe of coral, and reefs extend from its western shore to the north point of Prince of Wales island;

but the east side is bold and may be approached in from 5 to 7 fathoms water, to the distance of half a mile.

Although the strait which separates Horn island from Prince of Wales island is from one to $1\frac{1}{2}$ miles broad, it is so full of rocks and shoals that it can be considered nothing better than a boat channel. At the south-west side of the southern entrance to the strait is Cheropo islet, surrounded by a reef, it bears N. W. $\frac{1}{4}$ W. one mile from the north extreme of Entrance island.

Asp shoals are dangerous sand-banks, with as little as 6 feet water on their most shallow part, and upon which the sea often breaks; they extend about one mile E.N.E. and W.S.W., and lie with the north extreme of Entrance island and Rattlesnake point in line, and E.S.E. $3\frac{1}{2}$ miles from Horned hill. As there are depths of 8 or 9 fathoms close round these shoals, the lead gives no warning when approaching them.

Strait rock, N.E. $\frac{1}{2}$ E. 4 miles from Horned hill, is high, with trees upon it, and easily seen from a distance of 10 miles. Shoal water extends half a mile to the southward and westward, and a dangerous rock awash, lies half a mile to the northward of the rock.

Tuesday islets, named I. and II., lie about $1\frac{1}{2}$ miles to the westward of Strait rock, I. islet 3 miles, and II. islet $3\frac{1}{2}$ miles N.N.E. $\frac{1}{2}$ E. from Horned hill. The former is a small rocky island of moderate height, surrounded by a reef; the latter is smaller, and situated on the south-east corner of a triangular reef, about $1\frac{1}{4}$ miles in extent, with a spit of foul ground projecting half a mile from its northern angle. There is a rock above water between the two islets, and at one mile to the westward of I. islet are two others, on a small coral reef.

Although there is deep water between Strait rock and Tuesday islets, it is better avoided, as a shoal spit extends three-quarters of a mile to the south-eastward from I. islet.

WEDNESDAY ISLAND, the northern and western parts of which are high, is of triangular shape, its three points being nearly equidistant, and about 2 miles from each other; the south-east point, which is low and woody, lies N. $\frac{1}{4}$ W. $3\frac{1}{2}$ miles from Horned hill. Between Ince point, the north extreme of the island, and its western point, is a very shallow bay, the shoal water extending northward nearly to a line from Ince point to Wednesday spit, the north-west extreme of the shoal, and West $2\frac{1}{2}$ miles from Ince point. A shoal also runs out nearly 2 miles to the westward from the island, between which and Wednesday spit is a bight, affording sheltered anchorage in 5 and 6 fathoms, at about a mile to the north-westward of the west point of the island, out of the influence of

the tide streams; the southern portion of Wednesday island is skirted by a coral reef from one quarter of a mile to half a mile broad.

FLINDERS PASSAGE, which separates Horn island from Tuesday and Wednesday islands, is from $1\frac{1}{2}$ miles to half a mile broad, with a regular depth of about $4\frac{1}{2}$ fathoms. The channel is bounded to the southward by a spit projecting from the north side of Horn island, and to the south-westward by a mass of shoals, with narrow channels, lying between Horn and Hammond islands; the north-eastern edge of these shoals is shown by Channel rock, a small islet, 35 feet high, bearing W. by N. $3\frac{1}{4}$ miles from King point, the north extreme of Horn island.*

This passage has not been closely examined, but several rocks have lately been found in the eastern part, and banks of very shoal water at the north-west end; vessels are therefore recommended not to attempt entering Prince of Wales channel through it. The tidal streams run through this passage with great strength.

Scott rocks, nearly half a mile in circumference, are awash at high water, and have from 4 to 6 fathoms all round; they lie nearly in the middle of the eastern entrance of Flinders passage. From the centre of the rocks the south-east point of Wednesday island bears N.W. $\frac{1}{4}$ N., and King point S.W. by W.

Chapman reef, which dries at low water, lies nearly in the middle of Flinders passage; it is about 500 yards long, East and West, and 40 broad, terminating at each end in sharp points, which are steep-to. From the east end, the south-east point of Wednesday island bears N.E. by E., and King point, Horn island, S.E. by S. From the west end, the western point of Wednesday island bears N.N.W.; and Double hill, Horn island, S.S.W. $\frac{1}{4}$ W. Strait rock in line with the south point of No. I Tuesday island E. $\frac{1}{4}$ N., clears the south side of the reef.

Hannah rock is small in extent, with 3 feet on it at low water springs, and steep-to on all sides, with the following bearings: Channel rock, West; north-west extreme of King point on with the hill standing midway between that point and Horned hill S. $\frac{1}{4}$ E.; and the police magistrate's house on Vivien point nearly in line with the south-east peak of Friday island.

Nereid rock, on which the cutter *Nereid* touched, is reported as lying with Hammond rock on with the north-east point of Hammond island, and the south-east point of Thursday island on with Heath point.

DIRECTIONS.—Vessels entering Flinders passage from the eastward should keep the North point of Prince of Wales' island in line with

* See Admiralty plan of Normanby sound and Prince of Wales' channel, No. 691; scale, m = 2·0 inches.

the north-west extremity of Horn island while passing the line of the Midway hill and King point. After passing this line, the northern end of Channel rock should be steered for until the north-west end of Horn island bears S.W., when the beacons and buoy at the eastern end of Ellis channel will be in sight, and a course may be steered for the anchorage under Thursday island accordingly.

HAMMOND ISLAND (**Keriri**,) next westward of Wednesday island, is $3\frac{1}{2}$ miles long, and from one to 2 miles broad; it is 495 feet high at the north end, terminating in a bluff point, which seen from the eastward or westward appears as the north extreme of the group forming the southern boundary of Prince of Wales channel. The southern portion of the island is also hilly, with much wood and green valleys. The hills are precipitous, their summits in the centre of the island spread out into extensive concave surfaces, which form a natural reservoir for many streams, notably a large stream which passes through a picturesque gorge and discharges itself into the sea, on the north-west extreme of the island. The whole island is strewn with large stones and rocky boulders. No natives reside on the island permanently.

The eastern side of the island is fronted by shoals and shallow water extending in a triangular shape $1\frac{3}{4}$ miles to nearly as far as Channel rock.

Water.—In the month of March abundance of fresh water in streams was found on Hammond island. Water would probably be found all the year round.

Anchorage.—There is a shallow bay on the north-west side of Hammond island; but shoal water extends nearly a mile from its bight to Round islet and a rock above water close outside it. To the north-eastward of the bay the shoal is steep-to, and a vessel will find anchorage in 7 and 8 fathoms water, sheltered from the prevailing south-east winds, under the lee of the northern point of the island, at about one-third of a mile from the shore. The anchorages on the north-east and north-west sides of Hammond island are safe, and out of the influence of the strong tides which run through Prince of Wales channel.*

HAMMOND ROCK, half a mile to the northward of the north extreme of Hammond island, is small, but high and conspicuous, with a

* On the 8th September 1874, the *Challenger*, when at anchor between Wednesday and Hammond islands, experienced strong tide streams through the anchorage, the night tides being stronger than the day tides. The flood or west-going stream commenced to run about 4 hours after low water, and ran nearly 8 hours.

The ebb or east-going stream began at low water, and ran for 4 hours.

At Albany the flood and ebb streams would have commenced 3 hours earlier.

These peculiarities in the direction and strength of the tidal streams may not, however, hold good during the north-west monsoon.—Staff-Commander T. H. Tizard.

depth of 8 fathoms close outside it. This rock, from its position and remarkable shape, forms an excellent guiding mark for passing vessels.

GOODE ISLAND (Pálilug), immediately to the south-westward of Hammond island, is 340 feet high, and partly covered with wood. It is nearly 2 miles long and three-quarters of a mile broad; a narrow shoal skirts its southern side, but to the northward it is steep-to, and may be approached in 6 and 7 fathoms water to the distance of one quarter of a mile.

Signal Station.—On the summit of Goode island there is a flag-staff, the house for the signalman being about 50 feet below, and facing the north-west. From the station, around which the wood has been cleared, there is an uninterrupted view of both the ocean and the islands, and all vessels passing through either the Prince of Wales' channel or Normanby sound must be sighted: but owing to the prevalent direction of the winds, flags are difficult to distinguish from Thursday island, and *vice versâ*.

Wai-Weer.—The space between Hammond and Goode islands is blocked up by numerous coral reefs, with narrow boat channels between; in the southern part is the small islet of Wai-Weer, 45 feet high, with reefs extending half a mile East and West of each side of the southern end. The islet lies 2 miles W.N.W. from Vivien point, and it is occupied as a pearl fishing station. On its summit is a flag-staff and signal station.

Beacon.—A black beacon is placed on the southern edge of the reef, extending westward from Wai-Weer; the beacon lies North, distant 5 cables from the east side of Black rock.

IPILI REEF is a reef of rocks covering at half tide, lying half a mile to the northward of the north-east point of Goode island, and is about $1\frac{1}{4}$ miles in circumference. A small patch of 2 fathoms lies close off the north-east end of the reef, with this exception the reef is steep-to on all sides, and like Hammond rock, is a most useful mark for passing vessels. Ipili reef is marked by a red triangular beacon.

MONETA SHOAL, on which the barque *Moneta* touched in 1875, lies with the west extreme of Goode island bearing S.E. by E., Hammond rock N.E. by E. easterly, and Booby island W. by S. $\frac{1}{4}$ S. These bearings, taken while the vessel was on the shoal, will not give its exact position, but it is assumed to be nearly one mile from the west end of Goode island; due caution must therefore be exercised while navigating this part of the Prince of Wales channel.

THURSDAY ISLAND (Wai-ben) is high, partially wooded, and about $1\frac{1}{2}$ miles long N.E. by E. and S.W. by W.; it lies parallel to the south-east end of Hammond island, from which it is only about one-third of a mile distant. The island is surrounded by a coral reef which in parts covers at one-third flood; this reef on the north and south sides is narrow and fringed by shoal water, but the west end, where it extends half a mile from the shore, is bold-to, and at the east end very shallow water extends out $1\frac{1}{2}$ miles to as far as Channel rock.

On the edge of the coral reef, 3 cables off the north-east side of the island, is Kapuda islet, 25 feet high.

Thursday island has been selected as the position for the Government Establishment, which was formerly at Somerset: the settlement is on Vivien point, the south-west extreme of the island, and includes the magistrate's residence on a commanding knoll about 50 feet above high water, a court house, police quarters, &c., with a few scattered buildings to the eastward. The site of the township extends for a mile along a sandy beach opposite the anchorage, rising gradually to the summit of a ridge running east and west.*

Buoy.—A black buoy is moored close off the western edge of the reef, which extends West from the west extreme of Thursday island.

FRIDAY ISLAND (Ghéalug), 350 feet high, is 2 miles long, and separated from the northern extreme of Prince of Wales island by a narrow channel nearly blocked up by shoals. The southern part of the island is hilly, but it appeared fertile on the other side.

The north side of the island is fronted by a reef and shoal water extending nearly half a mile from the shore; on the eastern side of the shoal

* Thursday island will be found more convenient than Somerset as a centre for the pearl-shell fishing, which appears to have a permanent character. A small pilot cutter is attached to the establishment for visiting the islands, and supervising the fisheries. The fishing is carried on in small craft, varying from 3 to 30 tons, the islanders and natives from the neighbourhood being employed. There is also a prospect that a demand for some of the commodities of the settlement may be stimulated in New Guinea in exchange for the products of that island. Already many of the articles which constitute the equipment of the native pearl fisheries find their way across Torres Strait. From a report presented to the Queensland Government, by the Hon. John Douglas, C.M.G., 1878.

As a port of call for the mail steamers, it may perhaps be not quite so convenient as Somerset; the mail boats, from their draught of water, will have to enter by Normanby sound, and go out again by the same route, which will involve a detour of 10 miles; but to compensate for this the anchorage will no doubt prove to be much safer than that in Albany pass, where the tide sweeps through with great velocity.

water is Black rock, 70 feet high, and a little to the eastward, close off Webb point, the north-east end of the island, is the small islet of Kúnai.

NORMANBY SOUND is the space enclosed by the south part of Goode island, the south-west part of Hammond island, the west part of Thursday island, and north parts of Prince of Wales and Friday islands. It is about 4 miles long, and has an average breadth of nearly one mile. The entrance is between Quoin point, Goode island, and the west point of Friday island.

The only dangers are the Ghibber, the reefs off Wai-Weer island, and the reef off Thursday island. All these dangers are steep-to and marked by buoys or beacons, and vessels can generally stand over quite close to them, as they show clearly, unless the water is much discoloured.

The **Ghibber** is a small rock, situated N.E. by N., $2\frac{1}{10}$ cables from the nearest part of Black rock; it is just awash at low tides, and shows generally by a strong tide rip. There is a clear passage either side of it.

Buoy.—A red buoy is placed north of and close to the rock.

Anchorage.—Vessels not drawing more than 22 feet water will find here safe and commodious anchorage at all seasons. The best anchorage, especially with a strong S.E. monsoon, is in $4\frac{1}{2}$ fathoms, sand and small stones, on the south side of the sound with Kapúda island in line with the north-west point of Thursday island N.E. $\frac{3}{4}$ E., and the shoulder of Goode island range just clear of the high part of Wai-Weer island. Vessels will be much more out of the tide in this part than anywhere else in the sound.

DIRECTIONS.—After entering the sound from the westward, if intending to pass north of the Ghibber, keep Rose hill (245 feet high) on Thursday island in line with Kate point, Hammond island, E. by N.; if wishing to pass south of the Ghibber, keep the left summit of Double hill (295 feet high), Horn island, in line with Vivien point, E. $\frac{3}{4}$ S., southerly. When Tessy point, Goode island, is in line with the left extreme of Wai-Weer island N. by W. $\frac{1}{4}$ W. vessels will be clear of the rock, and may make for the anchorage. In standing over towards Thursday island, do not close Tessy and Powell points N.W.; this will ensure your being clear of the reef off Thursday island.

TIDES.—The tides are most irregular, often rising higher and running stronger at neaps than at springs. It appears that no rule can at present be made applicable to foretell either the time of high water or the change of stream. Sometimes the tide setting eastward, marked ebb on the chart, runs for 8 or 9 hours, and that too with both N.W. and S.E. winds. The same thing is observable with the western stream.

The extreme range observed was 11 feet 6 inches; this was at neap tides. The least range observed was 4 feet 6 inches; this occurred one day before new moon, on both occasions.

ELLIS CHANNEL, which connects Normanby sound and Flinders passage, and is the direct channel from Thursday island to cape York, lies between the south shore of Thursday island on the north side, and the Madge reefs on the south side, and is barely half a mile wide. The channel is navigable for vessels drawing not more than 16 feet. In mid-channel, between the east end of Thursday island and Horn island, is the Wilkie bank, which, taking the 2-fathoms line as its limit, is one mile long N.E. by N., and S.W. by S., and 200 yards wide. The shoalest water on it is 3 feet, situated 3 cables from the south end of the bank. At the eastern entrance to the channel is Hovel bank, nearly half a mile long E. by N. $\frac{1}{4}$ N. and W. by S. $\frac{1}{4}$ S., and about 200 yards broad, the least water on it is 6 feet.

At the western end of the channel, about mid-way between the reef which fringes Thursday island and the western end of Madge reefs, is Hovell rock, reported as having only 13 feet water on it, with 18 feet all round; from its centre, Channel rock is on with the south-east point of Thursday island, and Quoin point, Goode island, on with Vivien point.

Buoys and Beacons.—The following buoys and beacons have been placed in this channel:—On Hovell rock, a red buoy, with Quoin point, the south extreme of Goode island, in line with Vivien point, the south extreme of Thursday island bearing W. by N. $\frac{1}{4}$ N., and Channel rock in line with the south-east point of Thursday island bearing N.E. $\frac{1}{4}$ N. Madge reefs, a red beacon on the western edge, bearing S.E. by E. $\frac{1}{4}$ E., distant 7 cables from Vivien point; and a black beacon on the eastern edge, bearing S.S.E., distant $7\frac{1}{2}$ cables from east extreme of Thursday island. A red buoy S.S.E. from the east extreme of Thursday island, distant $6\frac{1}{2}$ cables. On Hovell bank, a black buoy at both the east and west extremities.

It is intended to place a red buoy North of the West Hovell bank buoy, distant $1\frac{1}{2}$ cables.

Anchorage.—Between the Madge reefs and the western end of the south side of Thursday island is excellent anchorage, out of the great strength of the tides, in from 3 to $3\frac{1}{2}$ fathoms, at a distance of from 2 to 3 cables from the shore, and abreast a fine sandy beach where the fringing reef is sunken, so that boats can be beached on sandy bottom at any time of the tide.

DIRECTIONS.—Steamers, when entering this anchorage from the westward, must be prepared for a very strong tide which sets through between Vivien and Heath points, while sailing vessels, except with a commanding breeze, must wait until the tide begins to slacken before getting under-weigh. When Vivien point is brought to bear N.W. the tide slackens, and vessels may choose any anchorage west of Wilkie bank in from 3 to 4 fathoms, sand, broken coral, and weed. When a strong mon-

soon blows against the direction of the tidal stream, a heavy tide-rip is formed between Vivien and Heath points.

Entering by the eastern end of Ellis channel, there is a narrow passage on either side of Wilkie and Hovell banks, with not less than 13 feet at low water. The channel can be entered from the eastward by keeping the low water line of Horn island on board until the hill on the south part of Friday island (301 feet high) is in line with the north extreme of Prince of Wales' island W. by S. $\frac{1}{4}$ S. southerly. This mark is *very* close to the north-east end of the Madge reefs, but the reef, in addition to being marked by beacons, is nearly always shown by the discoloration of the water. Attention to the chart and lead with a good look-out are necessary.

Aplin pass, between Thursday and Hammond islands, connects Normanby sound and Flinders passage; it is very narrow, but quite clear until abreast of Kapuda islet, where the reefs off Hammond island contract it to less than one cable wide; the reefs are steep-to and generally show. The continuance of the pass towards Channel rock has a depth of from 20 to 27 feet, but near the rock, where it is again less than a cable wide, there are only from 16 to 18 feet at low water.

DIRECTIONS.—Entering Aplin pass from Flinders passage, a vessel should pass about one-third of a mile eastward of Channel rock, and when Kate point, the south end of Hammond island, is just open of the next point east of it S.W. by W. $\frac{1}{4}$ W., steer for the pass. On nearing Kapuda islet a good look-out for the reefs is the best guide for getting through the pass.

Caution.—Natives.—Too much caution cannot be observed by defenceless boats' crews and small vessels, in their intercourse with the treacherous natives in the vicinity of Prince of Wales channel. In 1859, two boats' crews of the ship *Sapphire*, wrecked near Raine island, were attacked near Goode and Hammond islands, when 18 out of 29 of the passengers and crew of the *Sapphire* were, without any provocation, barbarously murdered by the natives, while bartering for turtle.

GERARD BANK consists of extensive sand-banks, which partly dry at low water, projecting in 'a W.S.W. direction about 5 miles from Friday island. The northern edge is irregular, but steep-to, and between it and Goode island is a clear passage from the westward to the anchorage in Normanby sound.

LARPENT BANK is a large covered sand-bank, extending from 5 to nearly 10 miles westward from Friday island, to within $4\frac{1}{2}$ miles from Booby island, where there is a depth of 13 feet, and with as little as 9 feet on it at $7\frac{1}{2}$ miles from Friday island which, with another bank to the southward of it, appeared to be separated from Gerard bank and the shoals extending to the westward from Prince of Wales island, by

navigable water. The northern side of Larpent bank is steep-to, with 7 fathoms water close to its edge.

BOOBY ISLAND, the westernmost island, or land of any kind, in Torres strait, lies W. by S. $\frac{1}{4}$ S. 14 miles from Goode island, and in lat. $10^{\circ} 36' 5''$ S., long. $141^{\circ} 54' 45''$ E.; it is fringed by a narrow coral reef, except at its south-west extreme, where it runs out about one-third of a mile, forming a spit on which the brig *Freak* struck in 1848, by incautiously rounding it too closely. There is temporary anchorage in 7 fathoms, under the lee of the island.

The island is about two-thirds of a mile in circumference, flat-topped, and 35 feet high, with a summit of bare rock. A valley intersects the north-west portion of the island, in which a few creepers, some brushwood, and two or three trees of tolerable size—with a particular broad green leaf, bearing a great resemblance to that of the wild almond of the West Indies—were seen, giving shelter to some pigeons and quails.

At a distance, Booby island has a whitish appearance, like a sand-bank, caused by the deposits of the boobies and other seabirds, which resort there during the season of incubation. Turtle used formerly to frequent the island, but are now rarely to be met with.

A chest with the words *Post Office* painted in large letters was placed on Booby island by H.M.S. *Bramble*, in 1845, for the reception of letters; it contained a book with writing materials in which vessels' arrivals and other information might be registered.

As Booby island is not inhabited, and its position is very favourable for the purpose, a supply of provisions and other necessities for the use of shipwrecked, or other distressed people, has been deposited in a cave at the base of the cliff on the west side of the island: this supply is renewed from time to time, by vessels passing through Torres strait from Sydney.

TIDES.—It is high water at Booby island, full and change, at 4h. 30m.; the stream setting to the westward 19 or 20 hours, and from North to N.E. 4 hours: but the ebb and flood by the shore were 6 hours each way.*

BANDA REEF, on which the barque *Banda* grounded in August 1874, is said to be 150 yards in extent, with 6 feet on it at low-water springs, and 7 fathoms around. From the reef, which is composed of sand and coral, Booby island bore S.W. distant $1\frac{1}{4}$ miles, but this position is doubtful.

DOUBLE ISLAND is one of the best marks for making Prince of Wales channel from the eastward, and for leading a vessel through it afterwards.

* These tidal observations were made in the south-east monsoon, by Captain Stokes, and may be presumed to mean at full and change, although not so stated.

Double island consists of two small islands, nearly touching each other, and situated on a reef $1\frac{1}{2}$ miles long, and nearly half a mile broad. The eastern island E.N.E. $8\frac{1}{2}$ miles from Ince point, the northern extreme of Wednesday island, is the largest, and is 218 feet high. It is partially covered with stunted trees and scrub, with some large rocks on its summit. The western island is low and woody.

Anchorage.—There is sheltered anchorage under the lee of the reef; be careful to avoid a small coral patch, at one quarter of a mile off its south side, and some foul ground and a rock with 13 feet water on it, over which there are tide ripples, extending N.W. and West, half a mile and three-quarters of a mile respectively from its west end.

MARINA ROCK, on which the British barque *Marina* struck in 1866, and afterwards sunk in 8 fathoms water, is said to be about 16 feet square, with a depth of only 4 feet on it. From the rock Double island bore E. $\frac{1}{4}$ N. 4 miles, Ince point of Wednesday island S.W. 4 miles, and Travers island N. $\frac{1}{4}$ W. $5\frac{1}{2}$ miles distant. Mount Augustus, in line with the summit of Travers island N. by W. $\frac{3}{4}$ W., leads eastward of Marina rock.

EAST STRAIT ISLET, S. by E. 2 miles from the eastern Double island, is small and rocky, with a sand-spit projecting from its north-west extreme, but as its limits have not been closely examined, shoal water may extend farther to the westward than at present laid down on the chart.

EDWARDS ROCK, seen from the ship *Melanie* in 1869, is very small, probably about 20 feet square, and with apparently about 6 feet water on it. From a position close to the rock, the peak of Pole island was just in sight eastward of Double island. Strait rock open northward of Horned hill; and the south point of Hammond island well open of the south point of Wednesday island.

Caution.—The position of this rock is doubtful, the bearings not quite agreeing, and as it lies close to the course recommended in approaching Prince of Wales channel from the south-east, a good look out should be kept when in the neighbourhood of East strait islet.

PRINCE OF WALES CHANNEL*, the best through the western part of Torres strait, passes north of Wednesday, Hammond, and Goode islands, and south of North-West reef. It is bounded to the southward by Ince point, Wednesday spit, Hammond rock, and Ipili reef, all of which, with the exception of Wednesday spit, are excellent guiding marks, and may be passed, in 7 and 8 fathoms water, at one-third of a mile off.

The northern side of Prince of Wales channel is formed by North-west

* A rock, on which the ship *Canon Harrison* is reported to have grounded, 1879, has on it a depth of about 16 feet at low water, and is about 35 yards in circumference, with depths of $6\frac{1}{2}$ and 8 fathoms close-to.

From the rock, as stated by Mr. J. R. Haws, Master of the *Canon Harrison*:—Hammond rock bears N.E. by E. $\frac{1}{4}$ E.; Ipili reef E. $\frac{1}{4}$ N.; Goode island, south-west extreme, S.E. $\frac{1}{4}$ S.; and White rocks, N.W. $\frac{3}{4}$ W.

24 yards in extent, lying from $3\frac{1}{2}$ to 4 miles south-westward of Mount Ernest island, with Pole island in line with the western extreme of the former island.

Yule channel, which is bounded to the southward by North Torres reef and to the northward by Hawkesbury island and reefs, is 10 miles long E. by N. $\frac{1}{2}$ N. and W. by S. $\frac{1}{2}$ S., and the greater portion is upwards of 2 miles broad, with regular soundings of 6 and 7 fathoms, except where sunken patches occur. In the western entrance of the channel, at about midway between North Torres reef and Hawkesbury island, are some dangerous coral patches, and to the westward of them several shoals and reefs extend from $1\frac{1}{2}$ to 3 miles to the south-westward of the island, with as little as 9 feet, or probably less water upon some of them. These shoals and sunken patches, without any mark to clear them, cause this to be an unsafe channel; it should therefore not be attempted, except in cases of emergency, more especially as it has not been thoroughly sounded.

DIRECTIONS.—In entering Yule channel from the eastward, bring Travers island to bear E. by N. $\frac{1}{2}$ N., then steer W. by S. $\frac{1}{2}$ S., closing the northern edge of North Torres reef, and afterwards skirting it at a distance of about one-third of a mile: when the southern peak of Hawkesbury island bears N.N.W. the greatest care is requisite, to pass between the small spit running out from the northern side of North Torres reef and the 2-fathoms patch, at half a mile to the northward of it, both of which have been already described, and may be distinctly seen from the mast-head, if the sun's glare be not in the course. A few minutes will suffice to pass between these shoals, when the vessel may haul up W.S.W. clear of all other dangers, and stand out to sea, passing at about a mile to the northward of White rocks.

When entering Yule channel from the westward, a vessel must be guided by bearings of White rocks, Hawkesbury island, and West island, northward of White rocks, and proceed according to the directions for passing through from the eastward.

Hawkesbury island, which is apparently barren, but partly covered with stunted trees and scrub, is nearly $2\frac{1}{2}$ miles long, and three-quarters of a mile broad. It rises to a ridge of craggy peaks 454 feet high, near the northern end: there is a still higher peak near the south point of the island, N.E. $\frac{1}{4}$ N. $7\frac{1}{2}$ miles from White rocks. A small islet and some rocks, enclosed by a shoal, lie near the north-west point of the island, and a rock above water lies close off the south point, on a coral spit.

Hawkesbury reefs, unlike those just described to the southward, are broken and irregular, extending from 2 miles N.N.W. to 8 miles

eastward from Hawkesbury island. The only well-defined edge is the northern portion, which sweeps round for about 4 miles from the north-west extreme of the reefs, to about $2\frac{1}{2}$ miles eastward of the island; and even this should not be approached within half a mile, on account of the shoal water which skirts it.

West island is much smaller, but of the same aspect as Hawkesbury island, from the southern peak of which it bears W. by N., distant 5 miles. It rises to two peaks, and on its western point is a small conical hill, resembling an islet at a distance; a low wooded point runs out on the north side of the island, and a narrow shoal skirts it to the southward. From the east side a shoal extends nearly the whole distance to Hawkesbury island.

West shoal is somewhat of a horse-shoe shape, with its points to the southward, and a patch of foul ground close to the northward of it. This shoal is about 2 miles long East and West, nearly one mile broad, and is separated from the west side of West island by a narrow 5-fathoms channel.

Anchorage.—There is anchorage in 7 and 8 fathoms, at about one mile to the north-westward of West island.

Natives.—Although West and Hawkesbury islands are not permanently inhabited, they are frequented by numbers of the natives of the neighbouring islands, who bear a fierce and very dangerous character.

Canoe islet, one mile to the north-westward of the north-west point of Hawkesbury island, is low, and situated on the eastern edge of a shoal, apparently $1\frac{1}{2}$ miles long North and South, and about one mile broad at its broadest part; but its southern edge has not been traced. A number of rocks above water, lie scattered over this shoal.

Tuft and Stonehenge are two small rocky islets, one N.W. by W. and the other N.W. by N. 2 miles from Canoe islet; they are both situated on the same shoal, which is about $2\frac{1}{2}$ miles long East and West, and $1\frac{1}{2}$ miles broad.

DUNCAN GROUP consists of five small rocky islands, with a few stunted bushes and some grass upon them, near which are numerous islets and heaps of rocks.

Spencer island, the southernmost of the Duncan group, is about $1\frac{1}{2}$ miles in extent, and of moderate height; it stands on the southern edge of the extensive shoals on which the Duncan islands are situated, and bears N.N.W. 4 miles from the north-west point of Hawkesbury island.

Spencer rock and a dangerous coral patch lie off the island, the former S.W. one quarter of a mile, and the latter S.E. by E. $1\frac{1}{2}$ miles from its southern point.

reef, the southern edge of which extends $7\frac{1}{2}$ miles in nearly a direct line from $2\frac{1}{2}$ miles N.W. by W. of Ince point, to 2 miles N.N.W. of Ipili reef. It may be skirted in from 6 to 9 fathoms water, within one quarter of a mile, except near its eastern end, and to the northward of Hammond rock, where spits of foul ground project about one-third of a mile; but this edge of the reef should not be approached within a mile, except when beating through, as the clearest part of the channel lies on the southern side, and some dangerous reefs and sunken patches lie across the northern portion of the western entrance.

Prince of Wales channel is about 10 miles long, from Ince point to Goode island, and one mile broad, with regular soundings, ranging from 7 to 10 fathoms.

Beacon.—A square black beacon is on the western side of the foul ground projecting southward from the eastern end of the North-west reef.

SUNK REEF (d.), the nearest of these dangers to the course recommended, is a covered coral patch at about midway between Ipili, or C. reef, and the western extreme of North-west reef: it is $1\frac{1}{2}$ miles long E.N.E. and W.S.W., and nearly one quarter of a mile wide; the least depth found on it was 2 feet; but there is deep water on either side.

At about W.S.W. $1\frac{1}{2}$ miles from the western end of d. reef, is a small 3-fathoms patch, between which and the west point of North-west reef is a chain of small, dangerous, sunken coral patches, with 2 and $2\frac{1}{2}$ fathoms water on them.*

DIRECTIONS.—A vessel coming from the eastward, should shape such a course as to pass at about one mile to the north of Ince point, and having brought it to bear South, and the highest part of Double island E. by N. $\frac{1}{4}$ N. northerly, steer W. by S. $\frac{1}{4}$ S. southerly for Hammond rock, keeping it a little on the port bow, which will take a vessel nearly in mid-channel, and clear Wednesday spit. Pass Hammond rock at a distance of 2 or 3 cables' lengths, then haul up S.W. by W. going between Ipili or C., and d. reefs, the beacon on the former being an excellent mark, but should that be gone they may be avoided by keeping the north extreme of the higher Double island well on with the north point of Hammond island, until the west end of Goode island bears South. Should Double island not be visible, steer the same course as before directed (S.W. by W.) after passing Hammond rock, bordering upon C. reef—which is always dry,—and giving d., with the patches westward of it, the more dangerous reef, a wider berth. When the west end of Goode island bears South, steer W. by S.,

* These reefs are reported by the signalman at Goode island to extend for $1\frac{1}{2}$ miles farther to the westward of d reef, than is shown on the Admiralty Chart. As these extension shoals are said to narrow Prince of Wales channel, great care should be taken when navigating in this vicinity. 1878.

which course will lead about half a mile northward of Moneta shoal, *see* page 335, and $1\frac{1}{2}$ miles to the northward of Larpent bank and one mile north of Banda reef, for which danger, the position being doubtful, a careful look out must be kept.

From the Westward.—A vessel intending to pass through Prince of Wales channel with a fair wind should pass at about 2 miles to the northward of Booby island, then steer E. by N. for the highest part of Hammond island, taking care to avoid Banda reef, and Moneta shoal; and keeping a good look-out for Δ reef and the shoal patches westward of it, as the course lies near this danger.

The precautions before mentioned, must be taken to pass between reefs

ERRATA.

To face page 342.

Page 342, line 5 from bottom, *for* "bears South, steer W. by S.," *read* "bears S.E., steer W. $\frac{3}{4}$ S."

Page 343, top line, *for* "half a mile northward of Moneta shoal, *see* page 335," *read* " $3\frac{1}{2}$ cables southward of Harrison rock, *see* foot note page 341."

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through Torres strait, because it is bounded on one side by high islands and rocks; it has fewer dangers in it than any other channel, and in approaching it from the westward, Booby island is a finger post to it.

TIDES.—Although the stream runs through with considerable velocity, they so nearly follow the direction of the channel, that with a commanding breeze, and ordinary care, no fear need be entertained of being set against any dangers. The rise of tide is from 9 to 12 feet.

NORTH-WEST REEF, which dries at low water, is $8\frac{1}{2}$ miles long nearly E. by N. $\frac{1}{2}$ N. and W. by S. $\frac{1}{2}$ S., and about one mile broad; a narrow shelf extends along the greater portion of its northern edge, and some shallow spits project about half a mile to the northward and westward from its west end. *See* page 342.

South Torres reef, which covers at high water, is about 8 miles long E. by N. $\frac{1}{2}$ N. and W. by S. $\frac{1}{2}$ S., and three-quarters of a mile broad. Midway between its extremes is a small sand-bank on the northern edge, $1\frac{1}{2}$ miles to the westward of which a shallow spit runs out about a quarter of a mile. The western point of the reef is enclosed by shoal

water, and a coral patch with 3 fathoms on it lies half a mile to the northward of the point; another patch with 3 fathoms on it lies nearly three-quarters of a mile S. by E. $\frac{1}{2}$ E. of the point, and there are also several other patches close off the reef a little farther to the eastward, the remaining portion of the south side of the reef is free from dangers, with 6 and 7 fathoms water close to its edge.

Dayman channel, between North-west and South Torres reefs, is $8\frac{1}{2}$ miles long, and about one mile broad, with regular soundings from 5 to 7 fathoms. The chief dangers are the detached patches just described in its western entrance. The tide streams are strong, and run in the direction of the channel—the flood to the westward and the ebb to the eastward.

There are no available marks to lead through Dayman channel, so that if the sun be ahead and the reefs are covered and seen with difficulty, it would be unsafe to attempt it. The direct course through from the eastward is W. by S. $\frac{3}{4}$ S., making due allowance for the tide stream, this course passes very close to the southern 3-fathoms patch mentioned above.

North Torres reef, which is also covered at high water, is 9 miles long, and $1\frac{1}{4}$ miles broad, lying parallel with North-west and South Torres reefs. The north and south sides of the reef are well defined, with deep water close-to, except at a small spit on the north side, at about 2 miles to the eastward of its west extreme; but shoal water extends three-quarters of a mile from its eastern end, and a number of coral patches, with as little as 4 feet water on them, lie one mile off the west point of the reef.

Simpson channel, between North and South Torres reefs although similar in extent and direction, is far superior to Dayman channel, as it is more free from shoals, and the dry sand-bank on the north edge of South Torres reef is, when seen, a good guide for the south side of the channel. The soundings are regular, from 5 to 7 fathoms; and the only shoal water yet discovered, besides what has already been described, is a 4-fathoms patch in about the centre of the western entrance; but the channel has not been very closely sounded. The tide streams are also strong here, but follow the direction of the channel—the flood setting to the westward and the ebb to the eastward.

The direct course through Simpson channel from the eastward is W. by S. $\frac{1}{2}$ S., making due allowance for the tide stream.

White Rocks, so called from being whitened by the numerous sea fowl by which they are frequented, are a group of bare granite rocks, about 12 feet high, N.W. $\frac{3}{4}$ W. $8\frac{1}{2}$ miles from Goode island. They are situated on the northern end of a sunken reef, $1\frac{1}{2}$ miles in circumference,

which course will lead about half a mile northward of Moneta shoal, *see* page 335, and $1\frac{1}{2}$ miles to the northward of Larpent bank and one mile north of Banda reef, for which danger, the position being doubtful, a careful look out must be kept.

From the Westward.—A vessel intending to pass through Prince of Wales channel with a fair wind should pass at about 2 miles to the northward of Booby island, then steer E. by N. for the highest part of Hammond island, taking care to avoid Banda reef, and Moneta shoal; and keeping a good look-out for *d* reef and the shoal patches westward of it, as the course lies near this danger.

The precautions before mentioned, must be taken to pass between reefs *Ipili* or *c.* and *d.* after which the directions already given, taken inversely, will answer for the rest of the passage through.

With a beating wind, a good mast-head look-out and a careful study of the chart, with attention to the lead, will afford the best means for guiding a vessel through, following the foregoing directions as nearly as an adverse wind and the strong tide streams will permit. Wednesday spit, and the edge of the shoal from thence to Ince point, are easily distinguished by the difference in the colour of the water, and the margin of North-west reef is clearly defined.

As it is useless for a vessel to attempt beating through Prince of Wales channel against a lee tide stream, no time should be lost in seeking a temporary anchorage near the entrance, so as to take advantage of the first favourable turn of the tide-stream.

Prince of Wales channel is the very best of all the western passages through Torres strait, because it is bounded on one side by high islands and rocks; it has fewer dangers in it than any other channel, and in approaching it from the westward, Booby island is a finger post to it.

TIDES.—Although the stream runs through with considerable velocity, they so nearly follow the direction of the channel, that with a commanding breeze, and ordinary care, no fear need be entertained of being set against any dangers. The rise of tide is from 9 to 12 feet.

NORTH-WEST REEF, which dries at low water, is $8\frac{1}{2}$ miles long nearly E. by N. $\frac{1}{2}$ N. and W. by S. $\frac{1}{2}$ S., and about one mile broad; a narrow shelf extends along the greater portion of its northern edge, and some shallow spits project about half a mile to the northward and westward from its west end. *See* page 342.

South Torres reef, which covers at high water, is about 8 miles long E. by N. $\frac{1}{2}$ N. and W. by S. $\frac{1}{2}$ S., and three-quarters of a mile broad. Midway between its extremes is a small sand-bank on the northern edge, $1\frac{1}{2}$ miles to the westward of which a shallow spit runs out about a quarter of a mile. The western point of the reef is enclosed by shoal

water, and a coral patch with 3 fathoms on it lies half a mile to the northward of the point; another patch with 3 fathoms on it lies nearly three-quarters of a mile S. by E. $\frac{1}{2}$ E. of the point, and there are also several other patches close off the reef a little farther to the eastward, the remaining portion of the south side of the reef is free from dangers, with 6 and 7 fathoms water close to its edge.

Dayman channel, between North-west and South Torres reefs, is $8\frac{1}{2}$ miles long, and about one mile broad, with regular soundings from 5 to 7 fathoms. The chief dangers are the detached patches just described in its western entrance. The tide streams are strong, and run in the direction of the channel—the flood to the westward and the ebb to the eastward.

There are no available marks to lead through Dayman channel, so that if the sun be ahead and the reefs are covered and seen with difficulty, it would be unsafe to attempt it. The direct course through from the eastward is W. by S. $\frac{3}{4}$ S., making due allowance for the tide stream, this course passes very close to the southern 3-fathoms patch mentioned above.

North Torres reef, which is also covered at high water, is 9 miles long, and $1\frac{1}{4}$ miles broad, lying parallel with North-west and South Torres reefs. The north and south sides of the reef are well defined, with deep water close-to, except at a small spit on the north side, at about 2 miles to the eastward of its west extreme; but shoal water extends three-quarters of a mile from its eastern end, and a number of coral patches, with as little as 4 feet water on them, lie one mile off the west point of the reef.

Simpson channel, between North and South Torres reefs although similar in extent and direction, is far superior to Dayman channel, as it is more free from shoals, and the dry sand-bank on the north edge of South Torres reef is, when seen, a good guide for the south side of the channel. The soundings are regular, from 5 to 7 fathoms; and the only shoal water yet discovered, besides what has already been described, is a 4-fathoms patch in about the centre of the western entrance; but the channel has not been very closely sounded. The tide streams are also strong here, but follow the direction of the channel—the flood setting to the westward and the ebb to the eastward.

The direct course through Simpson channel from the eastward is W. by S. $\frac{1}{2}$ S., making due allowance for the tide stream.

White Rocks, so called from being whitened by the numerous sea fowl by which they are frequented, are a group of bare granite rocks, about 12 feet high, N.W. $\frac{3}{4}$ W. $8\frac{1}{2}$ miles from Goode island. They are situated on the northern end of a sunken reef, $1\frac{1}{4}$ miles in circumference,

and a spit of foul ground extends nearly half a mile from its northern extreme, but the other edges of the reef are steep-to.

DIRECTIONS for Dayman and Simpson channels.—

In approaching these channels from the eastward, the vessel must be guided by cross bearings of Wednesday, Double, and Travers islands (the last is a rocky islet N.W. $7\frac{1}{2}$ miles from the east Double island), and when the bearings show her to be in a proper position for entering, steer W. by S. $\frac{3}{4}$ S. or W. by S. $\frac{1}{2}$ S. (the courses mentioned in the description of these channels) keeping as nearly in mid-channel as circumstances will permit, and taking care not to make the attempt if the sun be ahead.

In like manner, when approaching Dayman and Simpson channels from the westward, Goode island, White rocks, and Hawkesbury island (a large high island about 7 miles to the north-eastward of White rocks) will be found good marks for fixing the vessel's position, prior to making for the entrance of either channel. But in both cases a good look-out from the mast-head must be kept, to avoid the coral patches lying in the western entrances of the channels.

Channel islet, E.N.E. $5\frac{1}{2}$ miles from the southern summit of Hawkesbury island, is low, rocky, and partly covered with dense scrub; it is situated on the northern edge of the eastern Hawkesbury reefs, the east extreme of which extends about E. by S. $\frac{1}{2}$ S. 3 miles from the islet. The space between Channel islet and the reefs to the westward has not been closely examined, but probably consists of a continuation of the same reefs, covered with a greater depth of water.

Travers island, E. $\frac{1}{4}$ S. 8 miles from Channel islet, being 98 feet high, is a good mark for making Yule, and the adjacent channels, in coming from the eastward. It is small and rocky, with a few stunted bushes: foul ground extends three-quarters of a mile to the westward of it, off which are strong tide rippings, but the island may be approached to half a mile in other directions.

CAMPBELL REEF lies E. by N. $\frac{3}{4}$ N. $7\frac{3}{4}$ miles from Travers island, and was discovered by the commander of the ship *Storm Cloud*, in passing through Torres Strait, by the Great North-east channel. The reef is awash at low-water springs, and is nearly three-quarters of a mile long East and West, and one third of a mile broad.

As this danger lies in the route occasionally used by vessels bound through the Prince of Wales channel, from the eastward, great caution is required when passing this reef, more especially as a considerable space about it has not been sounded.

Hovell shoal, with 2 fathoms water on it, is said to be about

24 yards in extent, lying from $3\frac{1}{2}$ to 4 miles south-westward of Mount Ernest island, with Pole island in line with the western extreme of the former island.

Yule channel, which is bounded to the southward by North Torres reef and to the northward by Hawkesbury island and reefs, is 10 miles long E. by N. $\frac{1}{2}$ N. and W. by S. $\frac{1}{2}$ S., and the greater portion is upwards of 2 miles broad, with regular soundings of 6 and 7 fathoms, except where sunken patches occur. In the western entrance of the channel, at about midway between North Torres reef and Hawkesbury island, are some dangerous coral patches, and to the westward of them several shoals and reefs extend from $1\frac{1}{4}$ to 3 miles to the south-westward of the island, with as little as 9 feet, or probably less water upon some of them. These shoals and sunken patches, without any mark to clear them, cause this to be an unsafe channel; it should therefore not be attempted, except in cases of emergency, more especially as it has not been thoroughly sounded.

DIRECTIONS.—In entering Yule channel from the eastward, bring Travers island to bear E. by N. $\frac{1}{2}$ N., then steer W. by S. $\frac{1}{2}$ S., closing the northern edge of North Torres reef, and afterwards skirting it at a distance of about one-third of a mile: when the southern peak of Hawkesbury island bears N.N.W. the greatest care is requisite, to pass between the small spit running out from the northern side of North Torres reef and the 2-fathoms patch, at half a mile to the northward of it, both of which have been already described, and may be distinctly seen from the mast-head, if the sun's glare be not in the course. A few minutes will suffice to pass between these shoals, when the vessel may haul up W.S.W. clear of all other dangers, and stand out to sea, passing at about a mile to the northward of White rocks.

When entering Yule channel from the westward, a vessel must be guided by bearings of White rocks, Hawkesbury island, and West island, northward of White rocks, and proceed according to the directions for passing through from the eastward.

Hawkesbury island, which is apparently barren, but partly covered with stunted trees and scrub, is nearly $2\frac{1}{4}$ miles long, and three-quarters of a mile broad. It rises to a ridge of craggy peaks 454 feet high, near the northern end: there is a still higher peak near the south point of the island, N.E. $\frac{1}{2}$ N. $7\frac{1}{2}$ miles from White rocks. A small islet and some rocks, enclosed by a shoal, lie near the north-west point of the island, and a rock above water lies close off the south point, on a coral spit.

Hawkesbury reefs, unlike those just described to the southward, are broken and irregular, extending from 2 miles N.N.W. to 8 miles

eastward from Hawkesbury island. The only well-defined edge is the northern portion, which sweeps round for about 4 miles from the north-west extreme of the reefs, to about $2\frac{1}{2}$ miles eastward of the island; and even this should not be approached within half a mile, on account of the shoal water which skirts it.

West island is much smaller, but of the same aspect as Hawkesbury island, from the southern peak of which it bears W. by N., distant 5 miles. It rises to two peaks, and on its western point is a small conical hill, resembling an islet at a distance; a low wooded point runs out on the north side of the island, and a narrow shoal skirts it to the southward. From the east side a shoal extends nearly the whole distance to Hawkesbury island.

West shoal is somewhat of a horse-shoe shape, with its points to the southward, and a patch of foul ground close to the northward of it. This shoal is about 2 miles long East and West, nearly one mile broad, and is separated from the west side of West island by a narrow 5-fathoms channel.

Anchorage.—There is anchorage in 7 and 8 fathoms, at about one mile to the north-westward of West island.

Natives.—Although West and Hawkesbury islands are not permanently inhabited, they are frequented by numbers of the natives of the neighbouring islands, who bear a fierce and very dangerous character.

Canoe islet, one mile to the north-westward of the north-west point of Hawkesbury island, is low, and situated on the eastern edge of a shoal, apparently $1\frac{1}{2}$ miles long North and South, and about one mile broad at its broadest part; but its southern edge has not been traced. A number of rocks above water, lie scattered over this shoal.

Tuft and Stonehenge are two small rocky islets, one N.W. by W. and the other N.W. by N. 2 miles from Canoe islet; they are both situated on the same shoal, which is about $2\frac{1}{2}$ miles long East and West, and $1\frac{1}{2}$ miles broad.

DUNCAN GROUP consists of five small rocky islands, with a few stunted bushes and some grass upon them, near which are numerous islets and heaps of rocks.

Spencer island, the southernmost of the Duncan group, is about $1\frac{1}{2}$ miles in extent, and of moderate height; it stands on the southern edge of the extensive shoals on which the Duncan islands are situated, and bears N.N.W. 4 miles from the north-west point of Hawkesbury island.

Spencer rock and a dangerous coral patch lie off the island, the former S.W. one quarter of a mile, and the latter S.E. by E. $1\frac{1}{2}$ miles from its southern point.

Phipps island, about three-quarters of a mile to the northward of Spencer isle, resembles it in aspect and extent. A number of large rocks above water lies close to its shores, and there are several others at from half a mile to three-quarters of a mile to the south-westward of the island.

Whale island, 2 miles to the north-westward of Phipps island, is a little larger than either of the two just described, and like them is high and rocky, and is partly covered with stunted trees and dense scrub. Three rocks lie off its north-west end, and a coral reef extends one quarter of a mile from its south extreme.

The three islands just described, are connected by shoal water, which extends to the westward in two spits, bearing W.S.W. distant respectively $1\frac{1}{2}$ miles and 3 miles from Whale island, with 9 feet water.

Logan rocks are two remarkable blocks of stone, situated on a narrow shoal, one mile long, S.S.E. and N.N.W., and separated from the eastern of the two spits just mentioned, by a 6-fathoms channel, one-third of a mile broad.

Wilson islands, the two northernmost of the Duncan group, are high and stony, like those to the southward. The northern island is about one mile long, and half a mile broad; the southern island is much smaller: the former lies North 2 miles, and the latter N.N.E. $1\frac{1}{2}$ miles from Whale island. These, and a small islet between them, are situated on the north-west end of a shoal, apparently connected with Long reef to the eastward, and studded with rocks above and under water. The space between Wilson islands and the southern islands of the Duncan group, has not been closely examined; but it may probably afford secure anchorage, in 4 or 5 fathoms water, out of the influence of the tide streams.

Quoin rock, N.W. by W. one mile from the north Wilson island, is a mass of granite, shaped as its name implies, with a few bushes on its north end; there are some rocks above water, at three-quarters of a mile to the eastward of it, the whole being connected by a shoal, $1\frac{1}{2}$ miles long East and West, and about half a mile broad. Its north side is steep-to, with 8 or 9 fathoms water close to the edge; but some rocks above water lie between the shoal and north Wilson island.

N. W. reef, $2\frac{1}{2}$ miles to the north-eastward of Wilson islands, is the north-west spit of Long reef, between which and Spencer island, are numerous rocks and coral patches, with occasional deep water between.

Long reef, which is the largest detached coral reef in the western part of Torres strait, extends from a line between N.W. reef and Spencer island nearly E. by S. 12 miles, and is about 3 miles broad. Its two sides and eastern end are well defined and steep-to, except where two

small spits run out, one on the southern edge, 6 miles to the eastward of Spencer island, and the other on the northern edge, $2\frac{1}{2}$ miles eastward of the N.W. reef: at half a mile to the south-eastward of the former spit, are two small coral patches, and to the southward of the east end of Long reef is a dangerous patch, N.W. 3 miles from Travers island.

Bramble channel is bounded to the southward by Hawkesbury and Stonehenge reefs; and to the northward by Long reef, Spencer island, and the shoal extending to the westward from it. It is about 14 miles long and one-third of a mile broad, at its narrowest part. Its western entrance appears tolerably clear of dangers, but as the channel itself has not been closely sounded, many hidden patches may still remain undiscovered; and as the tide streams run 5 and 6 knots—the flood to the westward, and the ebb to the eastward—Bramble channel is not to be recommended, except in cases of necessity.

DIRECTIONS.—A vessel entering Bramble channel from the eastward, should bring Travers island to bear E. by S., and then steer W. by N. for the southern bend of Long reef, taking care to avoid the covered patches and spit to the westward of the bend: when Spencer island is approached within 2 miles, keep a good look out for the coral patch south-eastward of it, and pass between it and the island; then steer W. $\frac{1}{2}$ S., to clear Spencer rock and the sand-spit projecting to the westward from Spencer island.

To enter Bramble channel from the westward, bring Mount Ernest, in line with the south extreme of Spencer islet, and proceed on that line until Stonehenge, Canoe islet, and the southern peak of Hawkesbury island are in line S.E. $\frac{1}{2}$ S., the vessel will then be about half a mile off the southern edge of the reef extending westward from Spencer island; then steer for the south-west extreme of Long reef, between Spencer rock and the coral patch, to the south-eastward of it, and keep along the south edge of the reef, as directed in coming from the eastward.

MOUNT ERNEST (*Nagheer*), bearing N.E. $\frac{1}{4}$ N., $9\frac{1}{2}$ miles from Travers island, is a remarkable island, about $1\frac{1}{4}$ miles long N.N.E. and S.S.W., and three-quarters of a mile broad. It is of a triangular shape, the eastern side being high, and rising near its southern point, to a sharp peak, 751 feet high; at its northern extreme is another peak, 293 feet high. The western side of the island is low and sandy, but well wooded. Immediately behind the beach on its north-west side, and in front of a belt of jungle, is a village, consisting of a line of well-constructed huts, capable of accommodating about 150 persons. The only sign of fresh water was a small deep well behind the village, which in the month of December was nearly dried up. Between the village and the hills is a strip of forest land,

and several cultivated spots were seen, producing a broad-leaved kind of yam, and a larger proportion of another esculent root.

Mount Ernest island is fringed with a narrow coral reef, which is bold to approach on the eastern side; but some sunken patches lie off the western point, and a rock above water lies close to the north-east point of the island.

The inhabitants of the island appear, like those of most of the smaller islands in Torres strait, to be a migratory people, one small family only having been met with during the visit of H.M.S. *Rattlesnake*, in December 1849; the others, having probably left for a time, in consequence of the scarcity of fresh water, or perhaps on a turtle expedition.

Anchorage.—There is good anchorage in 7 or 8 fathoms on the north-west side of the island, at about three-quarters of a mile from the shore, sheltered from the prevailing south-east winds.

Peenacar, half a mile to the northward of Mount Ernest island, is a rock 103 feet high; there is a deep, but narrow passage between it and the sunken patches fronting the north-east point of Mount Ernest.

Pole island (*Gettullai*) N.N.E. $3\frac{1}{2}$ miles from Mount Ernest, is one mile long, one-quarter of a mile broad, and is fringed by a coral reef extending farthest from its eastern side. On the south-east end of the island is a hill 409 feet high, from which a rocky ridge, covered with stunted bushes, gradually descends to the north-western point of the island, from which a low sandy spit runs out to the westward.

At half a mile to the north-eastward of Pole island, are two rocks above water, surrounded by a small coral reef.

Burke island (*Suàràji*) N. by W. $1\frac{1}{2}$ miles from Pole island, is nearly 2 miles in circumference, and rises to a rocky peak, covered with bushes, 490 feet high. The island is low on the north-west side terminating in a spit, and is surrounded by a narrow fringe of coral, which may be approached within a quarter of a mile, except on its western side, where a shoal spit runs out about one-third of a mile from the shore. A patch of discoloured water was seen at about $1\frac{1}{2}$ miles to the westward of the island.

Pinnacle reef is a dangerous shoal, upon which the sea breaks, N.W. by N. about 3 miles from Burke island, but as it has not been closely examined, its extent is not known.

BANKS CHANNEL, which runs between Long reef and Banks and Mulgrave islands, is about 15 miles long, and $1\frac{1}{2}$ miles broad at its eastern entrance. The eastern, and greater portion of the channel is broad, well defined, and clear of dangers, but numerous islets, rocks, and shoals render the western entrance intricate and dangerous.

The southern boundary of Banks channel is ~~marked~~ by the steep edge of Long reef, N.W. reef, and the shoals extending from the latter to Quoin rock. See page 348.

The northern limits of the eastern portion of the channel are formed by the southern coast of Banks island, extending W. by N. $\frac{1}{2}$ N. 4 miles from South point, and rising to a hill at Gibbes head, a high steep bluff, partially covered with trees and underwood. The intermediate coast is low, with a margin of dense mangrove, and is skirted by an unbroken coral reef, from one quarter of a mile to half a mile broad, extending from South rock—which is detached and above water, at one-third of a mile off South point—to Gibbes head. On the east side of Gibbes head is a populous village, and many large canoes were seen moored among the mangroves to the eastward of it.

To the westward of Gibbes head, and abreast of the opening between Banks and Mulgrave islands, is a group of four small islands of moderate height, with a cluster of rocks between them, occupying a space about 2 miles in extent. Although of a rocky aspect, these islands are wooded, and present a more fertile appearance than the Duncan islands, described at page 347.

Barney island, the easternmost, and largest of the above-mentioned group has a spit of foul ground projecting two-thirds of a mile from its south-east point, from which a chain of coral reefs extends 2 miles to the south-west extreme of Banks island.

Clarke island, N.W. by W. $\frac{1}{2}$ W. three-quarters of a mile from Barney island, is small and of triangular form, with shoal water extending about half a mile to the southward and westward from it.

Browne island, which lies W.S.W. half a mile from Barney island, is bold to approach on its south-west side, and is a good mark for clearing the shoal water extending to the southward from Barney and Clarke islands. These three, with High island—the northernmost of the group—and the cluster of rocks between them, appear to be connected by shoals and coral reefs, extending nearly across the opening, from Gibbes head to Rugged point, the south extreme of Mulgrave island.

Green islet, $1\frac{1}{4}$ miles to the south-westward of Rugged point, is a narrow rocky islet, about half a mile long, upon which are a few trees, bushes, and some coarse long grass; a remarkable and nearly isolated rock forms its south extreme.

At half a mile to the eastward of Green islet is a heap of rocks, with deep water around them, and a shoal, on which is a long narrow ridge of coral sand, with 6 feet water on it, extends nearly 3 miles to the westward from the islet. Two detached banks, having respectively 3 fathoms and

1½ fathoms on them, lie from half a mile to about 1½ miles to the westward of the shoal, with deep water between.

Messum rock is small and remarkably white; it lies one mile to the westward of Green islet, with deep water close to the westward, but shoals and sunken rocks extend from it about one mile to the southward and eastward.

A small 2-fathoms knoll lies N.W. ¾ W. 2½ miles from Quoin rock, with the rock and the south-west extremes of Wilson islands in line. At about three-quarters of a mile to the eastward of the knoll is a shoal with 4 fathoms water.

The western entrance of Banks channel is contracted to half a mile in breadth, between N.W. reef and Messum shoals southward of Messum rock, and is the most difficult part of the channel to navigate, on account of the coral patches lying off N.W. reef. Eastward of Barney island the channel is from 1½ to 2 miles broad, with regular soundings of 7 and 8 fathoms, and apparently free from any outlying danger, unless one may exist where shown by a strong tide ripple, at about one mile W.S.W. of Gibbes head.

Anchorage.—There is good anchorage for vessels of the largest size, sheltered from every wind, in almost any part of Banks channel; the only objection being the strength of the tide stream, which sometimes run 5 knots—the flood to the westward, and the ebb to the eastward.

DIRECTIONS.—A vessel intending to enter Banks channel from the eastward, should steer for South point of Banks island, and round the east extreme of Long reef, on which the sea breaks, at a distance of about half a mile, when the water will immediately be smooth. Having entered the channel, follow the trend of Long reef, keeping as nearly as possible in mid-channel until mount Augustus on Banks island is in line with the south-east hill of Browne island, the latter half a mile distant; then steer for Messum rock, until the south extreme of Green islet is in line with Cocoa-nut point, the south-west extreme of Mulgrave island, and at the same time the centres of Clarke and High islands are in line with Banks peak, the north-easternmost peak on Banks island. Round the coral patches which skirt N.W. reef, and stand towards Quoin rock, keeping it open on the port bow, until the south-eastern Wilson island is in line with Whale island; then a West course will take the vessel clear of Banks channel, passing at about half a mile to the northward of Quoin rock.

In entering Banks channel from the westward, pass half a mile to the northward of Quoin rock, and steer East for the north-west extreme of Barney island, passing between the Messum shoals and the coral patches

skirting N.W. reef, which may be easily seen if the sun be not ahead. When the south point of Green islet is in line with Cocoa-nut point, alter course so as to pass half a mile to the southward of Browne island, and then keep in mid-channel, as before directed.

BANKS ISLAND is about 26 miles in circumference, and appears to be divided by the natives into two distinct districts, the eastern side being named by them *Mooa*, and the western *Eet*; the former is hilly, but the latter is low, and covered with mangroves near the shore. The highest part of the island is to the north-eastward, where three ridges of hills branch off from the interior, and terminate in rocky points, on the north coast of the island. The summits of the eastern ridge are mount Augustus and Banks peak; the former 1,310 feet, and the latter, which is close to the north-east extreme of the island, 1,246 feet high. The two deep valleys between these ridges are moderately wooded, and covered with green vegetation, presenting an appearance of fertility and richness of soil surpassing any seen about these islands.

From South point, the eastern coast of Banks island, consisting of small shallow bays and rocky points, trends nearly N.E. by N. $6\frac{1}{4}$ miles, to East point. Narrow coral reefs extend from point to point along the southern portion of this side of the island; but more to the northward the reefs extend farther out, the outer edge being nearly one mile from the shore, at 2 miles to the southward of East point. There are from 6 to 8 fathoms water at about a mile outside the edge of these reefs, but a 4-fathoms shoal, the extent of which has not been determined, lies E. by N. $\frac{1}{4}$ N. nearly 5 miles from South point.

East point projects to the north-eastward from an isolated hill, $1\frac{1}{2}$ miles to the south-eastward of Banks peak; there is a small bay within the point, but it is too much exposed to afford shelter from the prevailing south-east winds.

The northern and western coasts of Banks island, from the foot of Banks peak round to Gibbes head, are low, and chiefly covered with mangroves: but as they appeared inaccessible, on account of shallow water, they were not closely examined.

Watson cay is a small bank of coral-sand, with a little grass growing on it, N.E. 10 miles from Banks peak, and N.N.W. $\frac{1}{4}$ W. $7\frac{1}{2}$ miles from Burke island, it is situated on the north-west edge of a reef, about three-quarters of a mile long, which is steep to to the eastward, but a 3-fathoms patch lies nearly a mile to the westward of the cay, with foul ground beneath.

Portlock islet, nearly 3 miles to the north-eastward of Banks peak, is small, wooded, and rises to a peak 205 feet high; the islet is surrounded by a reef, extending about half a mile to the southward.

Tobin islet is merely a rock, with a few bushes and some long grass growing on it, $1\frac{1}{4}$ miles to the north-westward of Portlock islet, with which it appears to be connected by a reef, that has not been closely examined.

North Possession islet, about $1\frac{1}{4}$ miles from Tobin islet and nearly in line with Portlock islet, is small, wooded, and 200 feet high; it is surrounded by a reef from which a narrow spit of shoal water extends $1\frac{1}{4}$ miles to the north-westward. Some cocoa-nut trees were seen on the north-west end of the islet.

There is a clear channel, from 2 to 3 miles wide, with 5 to 8 fathoms water, between the three islets just described, and Banks island.

Providence shoal is a dangerous 2-fathoms bank, the southern extreme of which lies N. by W. $2\frac{1}{4}$ miles from Possession islet. It has been ascertained to extend upwards of a mile from S.E. to N.W., and it may continue still farther, as its limits in the latter direction have not been defined.

Basilisk bank, on which H.M.S. *Basilisk* grounded in 1878, is nearly $1\frac{1}{2}$ miles long East and West, and about half a mile broad, with from $1\frac{1}{2}$ to 3 fathoms over it, and on which with heavy south-east winds the sea is said to break. From the ship when aground, Possession islet bare S.S.E. $\frac{1}{2}$ E., Passage islet W. by N. $\frac{1}{2}$ N., and Bond islet S. by W. $\frac{1}{2}$ W.

The bank being composed of light sand and mud is liable to change its form and extent during heavy gales.

Bond islet and reef, W. $\frac{1}{2}$ N. $3\frac{1}{4}$ miles from Possession islet, is small, wooded and high at the north-west end, but low and covered with grass in other parts. A covered reef of the same name, extends 2 miles to the westward, and three-quarters of a mile to the south-eastward from the islet.

Black rock, $1\frac{1}{2}$ miles N.W. $\frac{1}{2}$ W. of Bond islet, is always above water, and has deep water round it, with a clear channel three-quarters of a mile wide, having from 4 to 6 fathoms water, between it and Bond reef. A small $2\frac{1}{2}$ fathoms shoal lies N.W. by W. $\frac{1}{2}$ W. one mile from Black rock.

MULGRAVE ISLAND (*Badoo*) is $7\frac{1}{2}$ miles long N. by E. and S. by W., and $6\frac{1}{2}$ miles broad. It is separated from the western side of Banks island by a channel from $1\frac{1}{2}$ to $2\frac{1}{2}$ miles wide, which is apparently too shallow even for the smallest vessels.

The eastern coast of Mulgrave island is low, and mostly covered with bush and mangroves, except within about 2 miles of Round Rock point, the north extreme of the island, where it is higher, and backed by a ridge of

stony hills, of moderate height. Some rocks above water lie near the shore from one to $2\frac{1}{2}$ miles south-eastward of the point. From the northernmost of these rocks, a shallow flat extends in nearly a straight line to the north-east point of Banks island. At half a mile off the edge of this flat, and abreast the northern entrance of the shallow strait which separates Banks, from Mulgrave island, are two small shoals, with $2\frac{1}{2}$ and 3 fathoms water, between which and Bond reef is a channel from one to $1\frac{1}{2}$ miles wide, where a vessel may find anchorage in from 4 to 6 fathoms, mud, with tolerable shelter from south-east winds; the only known danger in the way being a small shoal of $3\frac{1}{2}$ fathoms, at $1\frac{1}{2}$ miles off the north point of Banks island.

Rugged point, the south extreme of Mulgrave island, lies about N.W. by W. 6 miles from Gibbes head; the shallow space between forming, as before described, the southern entrance of the strait separating Banks, from Mulgrave island.

From Rugged point the south-west coast of Mulgrave island trends 5 miles north-westward to the west point of the island; there are two rocky projections between, Red point, at $2\frac{1}{4}$ miles, and Cocoa-nut point, $3\frac{1}{2}$ miles from Rugged point. Between Rugged and Red points is a shallow bay, with a narrow reef skirting its shores, and a native village at its head. A long flat rock lies one quarter of a mile off Cocoa-nut point, on the edge of a coral reef extending from Red point.

Flat islet, W.S.W. three-quarters of a mile from the west point of Mulgrave island, is low and rocky, with a small rock above water one quarter of a mile to the southward of it.

From the west point of Mulgrave island a low coast with rocky projections trends N.N.E. $\frac{3}{4}$ E. 3 miles to N.W. point. Shoal water, with several rocks, extends nearly three-quarters of a mile from the shore, on which is Obelisk islet, a remarkable rock $1\frac{1}{4}$ miles to the northward, of the west point of the island. The northern coast between N.W. and Round Rock points is low and woody, forming two bays, which are inaccessible on account of shallow water.

The interior of Mulgrave island is high, the most elevated part, Mulgrave hill, which bears N. $\frac{1}{4}$ W., $2\frac{1}{2}$ miles from Rugged point, being 686 feet in height. On the north side, a broken stony range of hills extends nearly across the island, East and West, of which the most remarkable are Two Stoned hill, at the east end, and Turret hill, at the west end of the range. Between the high land and the shores, the island appears fertile, and many cocoa-nut trees were seen upon the west and northern coasts, together with some villages and huts, but no cultivated land, nor fresh water, although there must be a constant supply of the latter, to support the numerous population.

The natives of Mulgrave island are of a much lighter colour than those of Australia, and by far a more intelligent race. They have large and well-built canoes, and use bows and arrows, but bear a hostile and treacherous character with the natives of the mainland, and with the Europeans, who have had intercourse with them, both at Mulgrave and the adjacent island, which are frequented by these people in great numbers.*

SOUTH BANK is an extensive covered shoal, on which the least depth of water found was 6 feet. It projects to the westward, from the south-west side of Mulgrave island, between Rugged point and Flat islet, and terminates in a narrow spit, W. $\frac{1}{4}$ N. 11 miles from Rugged point, with the south-west extremes of Whale and Spencer islands in line, S.E. $\frac{3}{4}$ E.

The northern edge of South bank is irregular, and forms the southern side of a deep inlet, between South and Middle banks; at the head of this inlet is Asp rock, a small black mass above water, W. by S. $\frac{1}{4}$ S about 2 miles from the west point of Mulgrave island; a small knoll, with $3\frac{1}{2}$ fathoms water on it, lies in the entrance of this inlet, at about $1\frac{1}{2}$ miles to the north-eastward of the west extreme of South bank.

Middle bank is of the same character as South bank, but its limits are not so well-defined. It extends to the south-westward $7\frac{1}{2}$ miles from the N.W. point of Mulgrave island, and also terminates in a narrow spit; from which Whale and Hawkesbury islands would, if visible, appear in line, bearing S.S.E. $\frac{3}{4}$ E. On this bank, at one mile to the northward of Asp rock, are the West rocks, above water, between which and the shore are several rocks and shallow knolls.

South and Middle banks are continuations of one extensive flat, projecting from the west side of Mulgrave island; the only deep water ap-

* In 1846 the Supercargo and a boat's crew from the *Thomas Lord*—a small vessel sent from Sydney to procure trepang and tortoise-shell—landed on Mulgrave island, to barter; the natives at first appeared friendly, but towards evening, circumstances occurred which induced the boat's crew to embark, and proceed to a small sand-bank, at about a mile off, to pass the night there. At about midnight they were attacked by the natives, when the Supercargo and three of the boat's crew were barbarously murdered.

It was reported by an English woman, rescued from the natives at cape York, by officers of the *Rattlesnake* and *Bramble*, that a white man, named Wini, had been on Mulgrave island many years, and that he had reached the island in a boat, after having, by his own account, killed his companions, three or four in number; in course of time he gained such an ascendancy in the tribe, by procuring the death of his enemies, and intimidating others, as to establish his fame as a warrior; so that, as matters stand at present, it is probable that, not only during his lifetime, but for many years afterwards, any European who may fall into the hands of the Mulgrave islanders, will meet with certain death.—Voyage of H.M.S. *Rattlesnake*. Vol. I. p. 308.

proaching to that side of the island being the inlet between these two banks.

NORTH BANK is of a similar nature to South and Middle banks, but is isolated : it runs nearly parallel with the general trend of the latter bank, from which it is separated by a channel, as yet imperfectly examined. North bank is 5 miles long E.N.E. and W.S.W., and nearly one mile broad: on its eastern end is Tree islet, which is small and rocky, with two remarkable trees growing on it. The south-western extreme of the bank lies in line with N.W. and Round Rock points, bearing E. by N. $\frac{1}{4}$ N.; and, if visible, the east extreme of Whale island will be in line with the highest part of Hawkesbury island.

Round islet, W. by S. $\frac{1}{4}$ S. about one mile from N.W. point, is small, wooded, of moderate height, and situated on a shoal, with dangerous sunken patches extending nearly one mile to the north-westward; but there is deep water between them and Tree islet, and there is a narrow channel between Round islet and the shore.

A high narrow island, about two-thirds of a mile long, lies about half a mile to the north-eastward of N.W. point, with some large rocks above water between it and the shore. Close off the north-west end of the island is a rock, also above water, from whence a chain of other rocks extends three-quarters of a mile to the south-westward.

South islet is small, rocky, partially wooded, and lies about $1\frac{1}{4}$ miles from the north-west end of the island last described, in line with N.W. point. Several rocks above water lie close off its north-west extreme; the whole being enclosed by a reef about half a mile in extent, which is steep-to on its north and west sides.

Strong Tide passage.—The reef of South islet, together with the chain of rocks just described, and the sunken patches projecting north-westward from Round islet, form the south-east boundary of Strong Tide passage, in which the stream runs with such velocity that the *Bramble* once worked through with a weather tide stream, although in some parts the channel is little more than one cable broad.

Mid-way rocks.—The north-west side of Strong Tide passage is the edge of a shoal nearly 2 miles long, N.E. and S.W., and about one mile broad. On its south side is a double islet, bearing N.N.W. three-quarters of a mile from N.W. point. The northern side of the shoal is formed by a narrow covered reef of coral, three-quarters of a mile long, E.N.E. and W.S.W., on which are the Mid-way rocks, two remarkable piles of stones, which mark the bend on the south side of Bligh channel, at about midway through it: there are several other rocks above water scattered over this shoal.

Mid reefs are a chain of coral patches nearly in the centre of Bligh channel, between Mid-way rocks and Farewell islets.

Farewell islets, N. by W. $1\frac{1}{2}$ miles from Tree islet, are both surrounded by a reef $1\frac{1}{2}$ miles in circumference; the larger islet is moderately high and densely wooded: the other is composed of large masses of granite, with a few trees.

These small islets are situated near the southern edge of a collection of irregularly-formed shoals, with small loops of deep water, extending from 2 miles north-westward of Tree islet, in a north-east direction, 4 miles to Jervis reef, and are from $1\frac{1}{2}$ to 2 miles across.

North island, $1\frac{1}{2}$ miles to the north-eastward of Mid-way rocks, is moderately high, covered with stunted scrub, and is situated on the south edge of a coral reef, extending East and West 2 miles, and forming the northern boundary of Bligh channel; this reef is steep-to, with 8 fathoms water close to its southern edge.

Two smaller islands, but of similar aspect, and a number of rocks above water, lie about three-quarters of a mile to the north-westward of North island, the whole being enclosed by a reef connected with the shoals extending to the north-eastward from Farewell islets.

Castle island, W.N.W. $1\frac{1}{2}$ miles from Round Rock point, is high, rugged, and covered with stunted bushes and long grass; a coral reef extends about 2 cables from its west point.

The space between Castle island and the north extreme of Mulgrave island is nearly occupied by rocky islets, shoals, and reefs, so as scarcely to afford room even for small vessels to anchor between them.

Castle reef is a narrow shoal, half a mile long: its western end, close off which is a small detached patch, lies 2 cables off the north point of Castle island. Although this is a covered reef, it can in general be easily distinguished by the overfalls upon it. There are some rocks above water between Castle reef and the islets to the southward of it.

North patch is a small sunken coral reef, with 4 feet water on it, lying N. by E. about one mile from Castle island, and 2 miles to the eastward of North island. At two-thirds of a mile to the north-westward of this shoal is a 2-fathoms patch, apparently forming the end of a spit, projecting nearly a mile to the eastward of North island reef.

JERVIS REEF is about $10\frac{1}{2}$ miles long, and from one to 2 miles broad; it is separated on the north side by Napoleon III. passage, which lies between it and another reef extending to the westward from the south end of Jervis island. This passage is about one mile broad, and on the north side of it are the Hamelin rocks, about $1\frac{1}{2}$ miles westward of Jervis

island; only one line of soundings of from $5\frac{1}{2}$ to 8 fathoms through the centre of this channel has as yet been obtained. The southern edge extends in nearly a straight line, from $2\frac{1}{4}$ miles northward of Farewell islets, to $4\frac{1}{4}$ miles north-eastward of Round Rock point, and then turns to the north-westward. No passage could be discovered between Jarvis reef and the shoals extending from Farewell islets to North island. About half a mile south-westward of the east end of Jarvis reef there is said to be a small patch of 2 fathoms, but the position is doubtful.

JERVIS ISLAND, which is situated on the north-east side of the reef of the same name, just mentioned, has not been closely examined, but it appeared to be at least from 8 to 10 miles in circumference. Near its southern extreme, mount Jarvis, the highest part of the island, rises to the height of 530 feet, and retains its sharp peaked appearance from whatever direction it is seen. Mount Jarvis bears N. $\frac{1}{4}$ W. $5\frac{1}{4}$ miles from Round Rock point, the north extreme of Mulgrave island.

Philip harbour is formed between a coral sand and mudbank, filling up the bay forming the south-east end of Jarvis island, and the southern part of the Scott islands and reefs lying eastward of it. The northern part of these reefs, on which are situated Florence island, 165 feet high, North islands and several rocks above water, is separated from Jarvis island by a passage one quarter of a mile wide, in which are from 4 to 5 fathoms water.

There are from 5 to $5\frac{1}{2}$ fathoms in the anchorage, which must be approached with great caution on account of the strong tides; H.M.S. *Basilisk* when anchored one mile from the shore dragged her anchor, the spring tide running 5 knots per hour. The best anchorage is about half a mile eastward of the northern part of Susie point, the southern extreme of Jarvis island. There is a pearl fishery station close to Ada point, the east end of the island.

Water.—A small supply of indifferent water is to be found on the island.

TIDES.—It is high water, full and change, at Philip harbour at about noon, springs rise from 10 to 14 feet. The tides are very irregular, the day tide rising to the full height, and the night tide only 2 or 3 feet. The streams run for 3 hours after high and low water.

Belle Vue Islands are a group of detached wooded islands off the north shore of Jarvis island; they are surrounded by extensive reefs, through which a boat passage exists. Tides run with unusual strength through the group.

Passage islet, E. $\frac{1}{4}$ S. $3\frac{1}{2}$ miles from Susie point, Jarvis island, is 156 feet high and rocky, producing some stunted trees and long grass, and is surrounded by a coral reef about half a mile in extent. A shoal

Mid reefs are a chain of coral patches nearly in the centre of Bligh channel, between Mid-way rocks and Farewell islets.

Farewell islets, N. by W. $1\frac{1}{2}$ miles from Tree islet, are both surrounded by a reef $1\frac{1}{2}$ miles in circumference; the larger islet is moderately high and densely wooded: the other is composed of large masses of granite, with a few trees.

These small islets are situated near the southern edge of a collection of irregularly-formed shoals, with small loops of deep water, extending from 2 miles north-westward of Tree islet, in a north-east direction, 4 miles to Jervis reef, and are from $1\frac{1}{2}$ to 2 miles across.

North island, $1\frac{1}{2}$ miles to the north-eastward of Mid-way rocks, is moderately high, covered with stunted scrub, and is situated on the south edge of a coral reef, extending East and West 2 miles, and forming the northern boundary of Bligh channel; this reef is steep-to, with 8 fathoms water close to its southern edge.

Two smaller islands, but of similar aspect, and a number of rocks above water, lie about three-quarters of a mile to the north-westward of North island, the whole being enclosed by a reef connected with the shoals extending to the north-eastward from Farewell islets.

Castle island, W.N.W. $1\frac{1}{2}$ miles from Round Rock point, is high, rugged, and covered with stunted bushes and long grass; a coral reef extends about 2 cables from its west point.

The space between Castle island and the north extreme of Mulgrave island is nearly occupied by rocky islets, shoals, and reefs, so as scarcely to afford room even for small vessels to anchor between them.

Castle reef is a narrow shoal, half a mile long: its western end, close off which is a small detached patch, lies 2 cables off the north point of Castle island. Although this is a covered reef, it can in general be easily distinguished by the overfalls upon it. There are some rocks above water between Castle reef and the islets to the southward of it.

North patch is a small sunken coral reef, with 4 feet water on it, lying N. by E. about one mile from Castle island, and 2 miles to the eastward of North island. At two-thirds of a mile to the north-westward of this shoal is a 2-fathoms patch, apparently forming the end of a spit, projecting nearly a mile to the eastward of North island reef.

JERVIS REEF is about $10\frac{1}{2}$ miles long, and from one to 2 miles broad; it is separated on the north side by Napoleon III. passage, which lies between it and another reef extending to the westward from the south end of Jervis island. This passage is about one mile broad, and on the north side of it are the Hamelin rocks, about $1\frac{1}{2}$ miles westward of Jervis

island; only one line of soundings of from $5\frac{1}{2}$ to 8 fathoms through the centre of this channel has as yet been obtained. The southern edge extends in nearly a straight line, from $2\frac{1}{2}$ miles northward of Farewell islets, to $4\frac{1}{4}$ miles north-eastward of Round Rock point, and then turns to the north-westward. No passage could be discovered between Jervis reef and the shoals extending from Farewell islets to North island. About half a mile south-westward of the east end of Jervis reef there is said to be a small patch of 2 fathoms, but the position is doubtful.

JERVIS ISLAND, which is situated on the north-east side of the reef of the same name, just mentioned, has not been closely examined, but it appeared to be at least from 8 to 10 miles in circumference. Near its southern extreme, mount Jervis, the highest part of the island, rises to the height of 530 feet, and retains its sharp peaked appearance from whatever direction it is seen. Mount Jervis bears N. $\frac{1}{4}$ W. $5\frac{1}{2}$ miles from Round Rock point, the north extreme of Mulgrave island.

Philip harbour is formed between a coral sand and mudbank, filling up the bay forming the south-east end of Jervis island, and the southern part of the Scott islands and reefs lying eastward of it. The northern part of these reefs, on which are situated Florence island, 165 feet high, North islands and several rocks above water, is separated from Jervis island by a passage one quarter of a mile wide, in which are from 4 to 5 fathoms water.

There are from 5 to $5\frac{1}{2}$ fathoms in the anchorage, which must be approached with great caution on account of the strong tides; H.M.S. *Basilisk* when anchored one mile from the shore dragged her anchor, the spring tide running 5 knots per hour. The best anchorage is about half a mile eastward of the northern part of Susie point, the southern extreme of Jervis island. There is a pearl fishery station close to Ada point, the east end of the island.

Water.—A small supply of indifferent water is to be found on the island.

TIDES.—It is high water, full and change, at Philip harbour at about noon, springs rise from 10 to 14 feet. The tides are very irregular, the day tide rising to the full height, and the night tide only 2 or 3 feet. The streams run for 3 hours after high and low water.

Belle Vue Islands are a group of detached wooded islands off the north shore of Jervis island; they are surrounded by extensive reefs, through which a boat passage exists. Tides run with unusual strength through the group.

Passage islet, E. $\frac{1}{4}$ S. $3\frac{1}{2}$ miles from Susie point, Jervis island, is 156 feet high and rocky, producing some stunted trees and long grass, and is surrounded by a coral reef about half a mile in extent. A shoal

Mid reefs are a chain of coral patches nearly in the centre of Bligh channel, between Mid-way rocks and Farewell islets.

Farewell islets, N. by W. $1\frac{1}{2}$ miles from Tree islet, are both surrounded by a reef $1\frac{1}{4}$ miles in circumference; the larger islet is moderately high and densely wooded: the other is composed of large masses of granite, with a few trees.

These small islets are situated near the southern edge of a collection of irregularly-formed shoals, with small loops of deep water, extending from 2 miles north-westward of Tree islet, in a north-east direction, 4 miles to Jervis reef, and are from $1\frac{1}{2}$ to 2 miles across.

North island, $1\frac{1}{2}$ miles to the north-eastward of Mid-way rocks, is moderately high, covered with stunted scrub, and is situated on the south edge of a coral reef, extending East and West 2 miles, and forming the northern boundary of Bligh channel; this reef is steep-to, with 8 fathoms water close to its southern edge.

Two smaller islands, but of similar aspect, and a number of rocks above water, lie about three-quarters of a mile to the north-westward of North island, the whole being enclosed by a reef connected with the shoals extending to the north-eastward from Farewell islets.

Castle island, W.N.W. $1\frac{1}{4}$ miles from Round Rock point, is high, rugged, and covered with stunted bushes and long grass; a coral reef extends about 2 cables from its west point.

The space between Castle island and the north extreme of Mulgrave island is nearly occupied by rocky islets, shoals, and reefs, so as scarcely to afford room even for small vessels to anchor between them.

Castle reef is a narrow shoal, half a mile long: its western end, close off which is a small detached patch, lies 2 cables off the north point of Castle island. Although this is a covered reef, it can in general be easily distinguished by the overfalls upon it. There are some rocks above water between Castle reef and the islets to the southward of it.

North patch is a small sunken coral reef, with 4 feet water on it, lying N. by E. about one mile from Castle island, and 2 miles to the eastward of North island. At two-thirds of a mile to the north-westward of this shoal is a 2-fathoms patch, apparently forming the end of a spit, projecting nearly a mile to the eastward of North island reef.

JERVIS REEF is about $10\frac{1}{2}$ miles long, and from one to 2 miles broad; it is separated on the north side by Napoleon III. passage, which lies between it and another reef extending to the westward from the south end of Jervis island. This passage is about one mile broad, and on the north side of it are the Hamelin rocks, about $1\frac{1}{2}$ miles westward of Jervis

island; only one line of soundings of from $5\frac{1}{2}$ to 8 fathoms through the centre of this channel has as yet been obtained. The southern edge extends in nearly a straight line, from $2\frac{1}{2}$ miles northward of Farewell islets, to $4\frac{1}{2}$ miles north-eastward of Round Rock point, and then turns to the north-westward. No passage could be discovered between Jarvis reef and the shoals extending from Farewell islets to North island. About half a mile south-westward of the east end of Jarvis reef there is said to be a small patch of 2 fathoms, but the position is doubtful.

JERVIS ISLAND, which is situated on the north-east side of the reef of the same name, just mentioned, has not been closely examined, but it appeared to be at least from 8 to 10 miles in circumference. Near its southern extreme, mount Jarvis, the highest part of the island, rises to the height of 530 feet, and retains its sharp peaked appearance from whatever direction it is seen. Mount Jarvis bears N. $\frac{1}{2}$ W. $5\frac{1}{2}$ miles from Round Rock point, the north extreme of Mulgrave island.

Philip harbour is formed between a coral sand and mudbank, filling up the bay forming the south-east end of Jarvis island, and the southern part of the Scott islands and reefs lying eastward of it. The northern part of these reefs, on which are situated Florence island, 165 feet high, North islands and several rocks above water, is separated from Jarvis island by a passage one quarter of a mile wide, in which are from 4 to 5 fathoms water.

There are from 5 to $5\frac{1}{2}$ fathoms in the anchorage, which must be approached with great caution on account of the strong tides; *H.M.S. Basilisk* when anchored one mile from the shore dragged her anchor, the spring tide running 5 knots per hour. The best anchorage is about half a mile eastward of the northern part of Susie point, the southern extreme of Jarvis island. There is a pearl fishery station close to Ada point, the east end of the island.

Water.—A small supply of indifferent water is to be found on the island.

TIDES.—It is high water, full and change, at Philip harbour at about noon, springs rise from 10 to 14 feet. The tides are very irregular, the day tide rising to the full height, and the night tide only 2 or 3 feet. The streams run for 3 hours after high and low water.

Belle Vue Islands are a group of detached wooded islands off the north shore of Jarvis island; they are surrounded by extensive reefs, through which a boat passage exists. Tides run with unusual strength through the group.

Passage islet, E. $\frac{1}{2}$ S. $3\frac{1}{2}$ miles from Susie point, Jarvis island, is 156 feet high and rocky, producing some stunted trees and long grass, and is surrounded by a coral reef about half a mile in extent. A shoal

with 10 feet water on it, lies $1\frac{1}{4}$ miles to the south-eastward of the islet. This danger is liable to shift in S.E. gales, large vessels therefore should not pass between the shoal and Basilisk bank until the passage has been thoroughly examined.

A narrow reef with $1\frac{1}{2}$ to 2 fathoms on it connects Passage islet to the southern of the Scott islands; nearly half a mile south-westward of the latter is Minnie rock, which dries 4 feet at low water, and has a shoal of 2 fathoms extending half a mile eastward of it.

ORMAN REEF.—From $2\frac{1}{4}$ miles north-eastward of mount Jarvis, the outer edge of Orman reef has been traced about 4 miles to the south-east, and thence nearly 18 miles north-eastward, it then turns to the north-west towards Turn-again island, westward of which are innumerable patches of reefs with channels through them, and apparently joining to the reef which extends about 4 or 5 miles off this part of the coast of New Guinea.

Bligh channel, the northernmost of all the known channels through Torres strait, is bounded to the southward by the $2\frac{1}{2}$ fathoms patch north-westward of Black rock, Castle reef, South Islet rocks, Mid-way rocks, Tree islet, and North bank.

And is bounded to the northward by Jarvis reef, North patch, North islet, and the shoals extending to the eastward from Farewell islets.

Bligh channel is little more than half a mile wide, between Castle reef and North patch, and the navigable part is barely two cables across, between Mid reefs and the south-east spit of Farewell shoals. The depth varies from 5 to 8 fathoms, except abreast of Mid-way rocks, where a $3\frac{1}{4}$ -fathoms patch lies in mid-channel; and as the tide streams rush through with great velocity, Bligh channel may be considered not only intricate but dangerous.

Anchorage.—A vessel may anchor in from 6 to 9 fathoms, at half a mile to the north-westward of Castle islet, and at the same distance to the north-eastward of Tree islet; but neither is recommended except as a temporary anchorage, on account of the strong tide streams.

DIRECTIONS.—A vessel coming from the eastward, intending to go through Bligh channel, should pass between Providence shoal and North Possession island, the channels on either side of the Basilisk bank not having yet been properly examined. When North Possession island bears South, one mile distant, steer W. by N. $\frac{1}{2}$ N. about $6\frac{1}{4}$ miles passing northward of Black rock and the $2\frac{1}{4}$ fathoms patch north-west of it, or until Black rock, Bond islet, and Banks peak are nearly in line; when, being at about one mile off the eastern end of Jarvis reef—which is easily seen,—the course should be altered to W. $\frac{1}{2}$ S., passing midway between Castle reef and North patch, and at about three-quarters of a mile north of Castle

islet, continue on towards Farewell islets, passing at a cable's length to the northward of South islet and Mid-way rocks, until North and Passage islets are in line, Round islet bears S. $\frac{1}{2}$ E. and Mid-way rocks are three-quarters of a mile distant. Then haul up S.W. by W. $\frac{1}{2}$ W., between Mid and Farewell reefs, and the summit of Passage islet, if visible, kept just open to the northward of the highest part of North islet, will lead a vessel midway between Mid reefs and the Farewell shoals, nearly touching the north-west edges of the former. When Tree islet is in line with the western extreme of Mulgrave island, a more westerly course may be steered out of the channel, passing at about half a mile to the northward of North bank.

From the Westward.—A vessel entering Bligh channel from the westward, being clear of North bank, and having distinctly made out Tree and Farewell islets, should steer so as to pass midway between the former and the north-western of the latter islets. When Tree islet is in line with the west extreme of Mulgrave island, and North isle bears N.E. by E. $\frac{1}{2}$ E., steer for the latter, and if Passage islet is seen, keep its summit a little open to the northward of that of North islet, and proceed as directed when coming from the eastward.

As it has already been stated that Bligh channel is dangerous on account of its intricacy, and the great strength of the tide streams, it is only necessary to add, that the mast-head should be the pilot's station, and when possible, an object should be kept on a bearing, to insure making good any given compass course.

REMARKS.—Of all the western channels through Torres strait Prince of Wales channel is decidedly the best, the disadvantages of Endeavour strait having been already explained. As in the several passages to the northward of Prince of Wales channel, described in the foregoing directions, the tide streams are rapid and uncertain, and there are but few marks to lead clear of the numerous dangers with which these channels are studded, it is strongly recommended that no vessel attempt to pass through Yule, Bramble, Banks, or Bligh channel, either from the eastward or westward, without first anchoring, and sending boats to point out the sunken dangers at the west entrances. Even with this precaution, and the aid of the chart a most vigilant look-out from the mast-head will be indispensably necessary, and in no case should the attempt be made with the sun ahead.

Caution.—During the N.W. monsoon, the water in the northern part of Torres strait is frequently so discoloured (probably by the fresh water from the rivers of New Guinea) that the eye is unable to detect the positions of the shoals.

**GREAT BARRIER REEFS FROM THE PARALLEL OF CAPE YORK TO
THEIR NORTHERN TERMINATION AT ANCHOR CAY.**

The various islands, reefs, and channels in the western part of Torres strait having been detailed, the northern portion of the Great barrier reefs with the adjacent islands and reefs will become the subject of the next section of the present chapter, in order that the concluding description of Torres strait may proceed westward, as vessels generally do, when passing through the Papuan, or Great North-east channel, from the Coral, to the Arafura sea; for few vessels have yet been known to attempt going eastward, against the prevailing south-east winds.

The GREAT BARRIER REEFS, in continuation from about the parallel of cape York, or lat. $10^{\circ} 40' S.$, (*see* page 322) take a northerly direction 16 miles, to Yule entrance, and consist of a chain of small semi-circular reefs, from one to 2 miles long, and about half a mile broad, with their points trending to the westward; their inner edges, and the narrow openings between them, being thickly strewn with small detached coral patches, the whole having the appearance from seaward of one unbroken line of barrier, without any perceptible channel, even for a small vessel. The water appears most free from dangers between 3 and 6 miles from the inner edges of this part of the barrier.*

YULE ENTRANCE, in lat. $10^{\circ} 23' S.$, long. $143^{\circ} 56' 30'' W.$, is about one mile wide, with a patch, on which the sea breaks, in mid-channel, leaving a passage, nearly one-third of a mile wide, on its south side. The channel within this patch widens to $1\frac{1}{2}$ miles, with 16 fathoms water, increasing to 23 and 28 fathoms to the westward. This entrance is not to be recommended, except in cases of necessity, especially during springs, when the streams run with such velocity as would render a sailing vessel unmanageable in light breezes, the flood having been known to run through the opening at the rate of 5 knots.

From a position 20 miles to the S.S.W. of Yule entrance, H.M.S. *Fly* crossed over, in nearly a direct line, to Mount Adolphus, between a number of detached reefs and sand-banks; this track being altogether more free from dangers than Middle passage, to the southward, already described at page 320.

From Yule entrance, the barrier takes a general N.N.E. direction for 43 miles, when it is succeeded by a narrow shoal, extending $3\frac{1}{2}$ miles to the northward of the extremity of the reef. On this shoal are from 2 to 4 fathoms water, with several dangerous sunken patches, and strong tide

* *See* Admiralty charts: Torres strait, Sheet 2, North-east and East entrances, No. 2,422; scale, $m = 0.25$ of an inch; and Coral sea and Great Barrier reefs, Sheet 2, cape Grafton to Torres strait, No. 2,764; scale, $m = 0.04$ of an inch.

rippings close off its north end, which lies in lat. $9^{\circ} 41'$ S., long. $144^{\circ} 14' 30''$ E.

This portion of the barrier differs in character from any part to the southward, as it here consists of a great many small patches, on which the sea breaks heavily ; and although there is deep water between them, they are still so close together as to present from seaward the appearance of an impenetrable barrier. The breadth of the reefs gradually decreases from Yule entrance to about 20 miles to the northward of it, where it is nearly half a mile wide, and from thence continues narrow to its northern extreme.

There is a dry sand-bank in lat. $10^{\circ} 10'$ S., just within the edge of the reef, at about 14 miles to the northward of Yule entrance. At $2\frac{1}{2}$ miles southward of the sand-bank just mentioned, is an opening nearly half a mile wide ; but with the same disadvantages as those previously described. At 5 miles to the northward of the same sand-bank, there appeared to be a tolerably clear opening, half a mile wide, but it was not sounded. The *Fly* and *Bramble* entered the reef by a gap in lat. $10^{\circ} 1'$ S. This passage is very narrow, but has a worse appearance from seaward than was found to be the case on trial.

CUMBERLAND PASSAGE, in lat. $9^{\circ} 52' 30''$ S., and bearing E.N.E. 6 miles from Murray island, is nearly half a mile wide ; there are two sand-banks, which are covered at high water, one at $1\frac{1}{2}$ miles to the south-westward, and the other, one mile to the north-westward of the entrance. This, like all the other openings through the barrier to the northward of Pandora entrance, is dangerous, and should not be attempted, except in such cases of extremity, as when the first opening that presents itself should be taken advantage of, in preference to the risk of being driven on the reef by the rolling swell and rapid flood stream, which a sailing vessel would find next to impossible to beat off against, in the event of being set too near the reef.

MURRAY ISLANDS are three in number, two of which are of considerable height, lying about $4\frac{1}{2}$ miles within the barrier, to the south-westward of Cumberland entrance ; and there being no other high land within 24 miles of them, these islands become good marks for showing a vessel's position when making this part of the barrier.

Maër, the north-eastern and largest Murray island, is nearly 2 miles long and about two-thirds of a mile broad. A conical peaked hill, in lat. $9^{\circ} 55'$ S., long. $144^{\circ} 2'$ E., rises abruptly from the south-west end of the island, to the height of 750 feet. From this peak a narrow backed ridge of much lower hills, well wooded, with many cultivated spots, extends to the north-east extreme of the island. The northern and eastern shores are skirted by a coral reef, from half a mile to two-thirds of a mile

broad; and some detached sunken patches lie off the western side of the island.*

Maër island is well wooded, and in many parts cultivated, producing cocoa-nuts, yams, plantains, and other vegetables and fruits; but it has not been yet ascertained if water is to be procured there, in sufficient quantities to supply a large vessel.

In 1873 a Missionary teachers and a Beche-de-mer establishment were situated on the west side of the island.

Dowar and Wyer are two rocky islets, surrounded by a narrow reef, at about $1\frac{1}{2}$ miles to the south-westward of Maër island. The former, which is the western islet, is about $1\frac{1}{2}$ miles in circumference, is well wooded, and rises to a conical peaked hill, 605 feet high. Wyer is apparently barren, with a coral spit running out to the south-eastward from it.

There is a deep channel between these and Maër island; but several patches lie in its western entrance.

Anchorage.—There is anchorage off the north end of Maër island in 25 fathoms, sand and shells, with the extremes of the island bearing S. $\frac{1}{4}$ E. and S.W. $\frac{3}{4}$ W. During the S.E. monsoon, a vessel might anchor nearer the shore.

Natives.—Some of these people are of a dark chocolate colour, and others nearly black. The men are about the middle size, active and muscular, their countenances being expressive of quick apprehension. The numerous dwellings seen near the shore, and the plots of cultivated land in different parts of the island had an appearance of comfort and civilisation, totally unknown among the savages of the adjacent coast of Australia.

These islanders are a warlike race, and are very dexterous in the use of their weapons, which chiefly consist of bows and arrows, of a very superior construction, requiring in their use great strength and address; and as they also possess large and fast canoes, with out-riggers, capable of carrying 18 or 20 men, they are not to be despised by a weak force navigating these seas. When meeting them upon equal terms, they leave a favourable impression, as they are honest in their dealings, and strong in professions of friendship.

TIDES.—It is high water, full and change, at the Murray islands at 9h. 30m.; springs rise 10 feet. Close to the northward of the islands the flood sets to the westward, and ebb to the eastward, about 2 knots at

* This and the two following islands are distinguished by the names given them by the natives, according to the statement of Mr. Lewis, when Master of the schooner *Isabella*, in search of the survivors of the *Charles Eaton*, wrecked on one of the Barrier reefs.—Nautical Magazine for October 1837.

springs. Between Maër and the two islets the tide stream runs with great force.

DIRECTIONS.—Numerous reefs, with deep but intricate channels between them, lie to the northward and westward of Murray islands, and as extensive shoals appear to block up these channels in the direction of mount Adolphus, vessels instead of attempting to penetrate that way, should haul out to windward, or south-eastward of the islands, and skirt the inner edge of the Great Barrier reefs to the southward, for about 16 miles, until abreast of the sand-bank in lat. $10^{\circ} 10' S.$; from thence nearly a W.S.W. course for 80 miles, will lead in comparatively clear water, to mount Adolphus, by the route once taken by the *Bramble*.

From $3\frac{1}{2}$ miles northward of the largest Murray island, a sort of inner barrier of large reefs takes a N.N.E. direction for 18 miles, to a dry sand-bank, situated on the centre of a chain of reefs extending $6\frac{1}{2}$ miles N.W. by N. and S.E. by S. A detached reef lies $2\frac{1}{2}$ miles to the north-eastward; another, W.N.W. 5 miles; and a third, which covers at high water, N.W. by W. $\frac{1}{2}$ W. $9\frac{1}{2}$ miles from the sand-bank.

FLINDERS ENTRANCE is the opening between this inner barrier and the northern part of the Great Barrier reefs, before described. The length of the channel is about 18 miles, from its north-east entrance to the largest Murray island, and it is about $4\frac{1}{2}$ miles wide. Several shoal patches were seen near the middle, about $5\frac{1}{2}$ miles from the entrance, and many others may yet remain to be discovered. With the exception of a deep hollow in mid-channel, abreast of Cumberland entrance—where was bottom with 50 fathoms—the soundings appeared tolerably regular, ranging from 17 to 35 fathoms, sand and coral.

Flinders entrance, although a good one, does not lead to any direct route through Torres strait; it is therefore only to be recommended as affording the nearest approach to the Murray islands from seaward, and perhaps temporary anchorage to a vessel making the Great Barrier reefs too late in the day, to proceed farther before dark.

DIRECTIONS.—In entering Flinders channel, care must be taken in rounding the spit of foul ground running out from the point of the barrier, at the southern side of the entrance, across which the flood stream sets to the westward and the ebb to the eastward. A vessel having rounded this spit, and brought Murray islands to bear S.W. by S., at which time they will appear in line, should steer for them, keeping them a little on the starboard bow, to avoid the shoal patches lying near the middle of the channel, at about 5 miles within the entrance.

Anchorage may be obtained in 20 and 25 fathoms, on the north-west side of the largest Murray island.

EAST CAY in lat. $9^{\circ} 23' 45''$ S., long. $144^{\circ} 12'$ E., is a low dry sand bank, at about 11 miles to the northward of the sand-bank, before mentioned, on the northern side of Flinders entrance. It is situated on the north-west end of a cluster of reefs, about $3\frac{1}{2}$ miles long and $1\frac{1}{2}$ miles broad. There is a clear passage, 7 miles wide, between these reefs and the north extreme of the inner barrier, immediately to the northward of Flinders entrance, with an average depth of 30 fathoms water.

ANCHOR CAY the northernmost termination of the Great Barrier reefs, in lat. $9^{\circ} 22'$ S., long. $144^{\circ} 6'$ E., and W. by N. $\frac{1}{4}$ N. 6 miles from East cay, is a bare sand-bank near the north-west end of a reef about 5 miles in circumference. It has not been closely sounded on the western side, but the water appeared deep all round it. There is a deep channel, about 4 miles wide, between this and East cay.

REEFS outside the BARRIER.—A chain of large, detached, and imperfectly known reefs extends outside of and nearly parallel with the Great barrier reefs, from lat. $10^{\circ} 28'$ S., long. $144^{\circ} 27'$ E., to nearly 65 miles N. by E. $\frac{1}{4}$ E. of that position, leaving a clear sea between, from 20 to 30 miles wide.

The southernmost of these outer reefs were seen from the ships *Claudine* and *Mary* in 1818, extending 11 miles to the northward from lat. $10^{\circ} 28'$ S., and appeared to be a southerly continuation of the reefs seen by Mr. Ashmore, commander of the ship *Hibernia* in 1811, extending from lat. $10^{\circ} 16'$ S., long. $144^{\circ} 27'$ E. to 13 miles northward of this position.

BOOT REEF—so named by Captain Flinders, who discovered it in 1803—lies with its south-west extreme at about 6 miles to the eastward of the northern extreme of the reefs just described as seen by Mr. Ashmore. The north extreme of Boot reef lies in lat. $9^{\circ} 59'$ S., long. $144^{\circ} 41'$ E., according to Captain Flinders, who thus describes it:—"This reef lies " N.N.E. and S.S.W., and is about 7 miles long, with a breadth from 2 to " 3 miles; its form is nearly that of a boot, and the outer edges are pro- " bably dry at low tide; but there was a considerable space within, where " the water looked blue, as if very deep.

"The origin of that class of islands which abound in the great ocean " under the names of bow, lagoon, &c., may here be traced. The exterior " bank of coral will, in the course of years, become land, whilst the interior " water will preserve its depth to a longer period, and form a lagoon, with " no other outlet than perhaps one or two little openings for canoes or boats. " In Mr. Dalrymple's chart of H.M.S. *Pandora's* track, there is a dry sand- " bank marked on the north-west part of the reef, but this commencement of " the metamorphosis was not visible to us, probably from its being covered " by the tide, for it was then near high water. In some future age, when

“ Boot island shall be visited, this little remark, if it live so long, may be of some interest to the geographer.” *

Captain Flinders could find no bottom with 70 fathoms under the lee of this reef at the distance of a mile.

Some other detached reefs were seen by Mr. Ashmore, extending from 2 to 4½ miles to the south-eastward of Boot reef.

PORTLOCK REEFS, discovered by Captains Portlock and Bligh in 1792, form the northern portion of this extensive chain. Its north-easternmost extreme consists of a lagoon reef in lat. 9° 28' S., long. 144° 53' E., from which portions of the reefs, with the sea breaking on them, were found by H.M.S. *Fly* to extend nearly S.W. by W. for 10 miles and from thence to trend 5 miles in a southerly direction. Captain Flinders, in 1802, saw a continuation of these reefs, extending to the southward as far as lat. 9° 49' S., long. 144° 45' E.

PANDORA PASSAGE is an apparently clear opening, 10 miles wide, between the southern termination of the reefs just described, and Boot reef.

The southern portions of Portlock and Boot reefs, and those seen farther to the southward by Mr. Ashmore and from the ships *Claudine* and *Mary* have not been yet examined, but many of the positions determined in the *Fly* were found to agree in a very satisfactory manner with those of Captains Bligh and Flinders.†

REMARKS.—The Great Barrier reefs, with the various passages through them, and the communications with the Inner route and the mainland, having been now as minutely described as a careful search into the collection of data, from which the details have been gathered, will permit, it only remains to call particular attention to the general and precautionary remarks at page 458.

PAPUAN OR GREAT NORTH-EAST CHANNEL.

Although much has unquestionably been done to render the passage through Torres strait less dangerous than formerly, by the erection of a beacon on Raine island to lead vessels into the best channel through the Great Barrier reefs; and by the careful survey of the approach to the mainland; yet, owing to the strong north-west current outside the

* Captain Flinders' *Terra Australis*. Vol. II. p. 336.

† As farther evidence of the general correctness of the longitude of these reefs, it is worthy of remark, that the longitude of the highest peak of the Murray islands, according to Captain Flinders, is identical with that assigned to it by the more recent surveys of H.M. Ships *Fly* and *Rattlesnake*.

barrier, and the heavy weather, especially at full and change of the moon, vessels might possibly be drifted past the beacon, and the various entrances between the parallels of $12^{\circ} 15'$ and $11^{\circ} 25' S.$, it is satisfactory to know that this broad, safe, and clear channel exists for a vessel to run for, where there is room to lay to during the night, in its north-east entrance, or find anchorage under the lee of the reefs.

Since Captain Denham's survey of the Coral sea, many vessels have adopted the Great North-east channel in preference to Raine island, or either of the adjacent passages to the southward. And as the Great North-east channel becomes more frequented, its safety and other advantages will doubtless be so well known as to cause it to be recognized as the principal route from the Coral sea to Torres strait.

BLIGH ENTRANCE, the best approach to the Great North-east channel from the Coral sea, is a clear space 18 miles broad, between Anchor and Bramble cays, with regular soundings, in from 13 to 40 fathoms, coral sand, and in some parts mud.

BRAMBLE CAY is a small sandy islet, in lat. $9^{\circ} 7' 50'' S.$, long. $143^{\circ} 52' 10'' E.$, and N. $\frac{3}{4} E.$ $28\frac{1}{2}$ miles from Darnley island: it is about 10 feet above the level of the sea, and covered with vegetation, with a mass of black rocks, about as high as the cay, nearly adjoining its south-east extreme; and being visible at a distance of 7 or 8 miles from a vessel's deck, is one of the best marks for making the Great North-east channel from the north-eastward. The islet is surrounded by a reef nearly 4 miles in circumference, which is partially dry at low water, and affords tolerable anchorage in about 20 fathoms, under its lee.

Bramble cay is similar in character to Raine island, producing a little grass, and a coarse vegetable resembling spinach and a very good substitute for it. Turtle and innumerable sea birds resort to the island to deposit their eggs; at certain seasons of the year numbers of the former are easily captured at night, and the eggs of the latter may be procured in abundance.*

BLACK ROCKS.—A patch, on which are some rocks, the highest of which can be seen at high water, lies S.W. 3 miles from Bramble cay, with a clear passage between. These rocks have deep water round them, and may be approached to the distance of a mile.

TIDES.—It is high water, full and change, at Bramble cay, at 9 h. 15 m.; springs rise 12 feet. The flood sets to the westward, and the ebb to the eastward, from one to $1\frac{1}{2}$ knots.

* In December 1849, there was a small stream of fresh water springing up through the coral near the centre of the cay; and in one night 18 fine turtle were captured. Mr. G. H. Inskip, H.M.S. *Bramble*.

DARNLEY ISLAND (*Erroob*), the principal guiding mark for the Great North-east channel into Torres strait from the eastward, is of volcanic formation, and about 5 miles in circumference. Its highest part is a peak rising from the western portion of the island to a height of 610 feet, in lat. $9^{\circ} 35' 20''$ S., long $143^{\circ} 45'$ E. A coral reef projects nearly 3 miles to the eastward from the island, and then takes a sharp turn for $2\frac{1}{2}$ miles to the northward; the northern part being about three-quarters of a mile broad. The south side of the island, is skirted by a narrow border of coral; but the north and west sides are bold and free from dangers.

Some native missionary teachers reside on the west side of the island, near the principal village; a Beech-de-mer station is also established there.

Darnley island is varied with hills and plains, and the richness of the vegetation bespeaks its fertility: the sago palm grows very luxuriously on this island. It appeared, however, scantily supplied with water, as none has been found, except at a small pool, at about 200 yards from the beach, behind some trees at the head of Treacherous bay, in which is collected a small rill of water running down from the hills; here, in the month of June, may be obtained a moderate supply of fresh water, but during the dry season it is scarce. Treacherous bay is distinguished by a remarkable projecting knob of rock on the north side of the island.*

Anchorage.—Good anchorage, in 14 or 15 fathoms, sheltered from south-east winds, may be obtained off Treacherous bay, on the north side of the island, at half a mile from the shore.†

Natives.—It is necessary to remark that before sending for water or attempting to cut wood on Darnley island, permission should be obtained from the natives, and they should be conciliated by a small present of knives or axes, as they quite understand the rights and value of property, and when visited by the *Fly* and *Bramble* in 1845, were found to be honest in their dealings, and eager for barter. They have superior canoes, and are a far more intelligent and industrious people than any of the natives of Australia; but they must not, even now, be too implicitly trusted, especially by a weak-handed vessel.

* This bay derives its name from a tragical event which happened in 1793, when Mr. Shaw, Chief mate of the *Chesterfield*, Mr. Carter, and Captain Hill of the New South Wales corps, with five seamen, went away armed, in a whale-boat, and having landed, Captain Hill and four seamen were murdered by the natives; the remainder of the party providentially reached Timor Laut in the boat.—Captain Flinders' *Terra Australis*, Introduction, p. xxxiii.

† H.M.S. *Basilik*, in February 1873, found an abundant supply of fresh water, but difficult to obtain, on account of the extent of the shore reef.

Plantations enclosed within neat fences of bamboo, were extensive and numerous in the plains, and contained yams, sweet potatoes, plantains, and sugar canes; and cocoa-nut trees were very abundant, particularly near the habitations of the natives. These dwellings were generally at the heads of the small coves, and formed into villages of 10 or 12 huts, each enclosed within a bamboo fence, at least 12 feet high; the hut resembles a haycock, and may contain a family of 6 or 8 persons.

TIDES.—It is high water at Darnley island, full and change, at 9h. 30m.; springs rise 12 feet. In mid-channel, however, between Darnley island and Warrior reef, to the westward, the tide is full two hours later than by the shore.

DANGERS.—A sand-bank, slightly vegetated, and nearly one mile long, lies about N.E. by N. 7 miles from Darnley island; it is situated on the northern end of a reef 10 miles long N. by E. and S. by W., and of a uniform breadth of about a mile throughout, forming an elbow to the eastward, nearly midway between its two extremes. A bank of foul ground skirts the north-west edge of this reef, from its northern extreme to $2\frac{1}{2}$ miles south-westward of the sand-bank, where it terminates in a rocky spit, with 2 fathoms water on it.

There is a clear deep channel between the above reef and that projecting to the north-eastward from Darnley island; but it gradually narrows towards its south-western end, where it is only half a mile wide, with a depth of 30 fathoms, and apparently leading out to the southward.

Three small dangerous reefs to the north-westward of the vegetated sand-bank, lie nearly in line, N.E. and S.W.; the first W.N.W. 5 miles; the second N.N.W. $5\frac{1}{2}$ miles; and the third N. $\frac{1}{4}$ W. $6\frac{1}{2}$ miles from the sand-bank; the two former have on them banks of sand, awash at high water; and the third, which is the north-easternmost of the three reefs is awash at low water. A rocky shoal also lies about 7 miles N.E. $\frac{1}{4}$ N. from the vegetated sand-bank, it is 2 miles long N.W. by N. and S.E. by S., but is less than one-quarter of a mile wide, the least water found was 4 fathoms on the southern end.

In approaching Darnley island from the northward, these dangers must be cautiously looked out for; at low water they may be seen; at other times, the tide rippings, and in fine weather, the discoloured appearance of the water, will show their positions, besides which, the sea generally breaks upon them.

Channel between Darnley and Murray islands.—The only known channel between these islands is circuitous, and entered from the northward, on the east side of the vegetated sand-bank just described, off which are two rocky patches; one with 3 fathoms water on it, N.E. 2 miles; and the other with 7 fathoms, $3\frac{1}{2}$ miles

eastward of the sand-bank. With these exceptions the northern entrance of the channel, for a breadth of at least 8 or 10 miles, from the westward is free from shoals, the depth varying irregularly from 14 to more than 48 fathoms. This channel has not been closely sounded or examined to the southward, the only eastern limits traced being an irregular chain of reefs extending to the northward 5 to 15 miles from Murray island, and forming a bight to the eastward.

In the event of using this channel, it must be navigated with great caution, and only in clear weather, choosing, if possible, low water or half tide for passing the eastern reefs, before altering course to the eastward.

Canoe cay is a sand-bank, bearing S.E. $\frac{1}{2}$ S. 7 miles from Darnley island: it lies on the north-western end of some reefs, which appeared to extend south-eastward, and from the western side of the channel just described between Murray and Darnley islands; this channel is here about 4 miles broad, with a 3-fathoms patch nearly in the middle, and irregular soundings, varying from 8 to 60 fathoms.

At W.N.W. $4\frac{1}{2}$ miles from Canoe cay, is another sand-bank, on the southern part of some reefs extending 6 miles southward from Darnley island.

Tobin cay, W.S.W. 6 miles from Darnley island, is a small sand-bank, on the northern extreme of a chain of reefs, which was traced for 9 miles nearly S.S.E. $\frac{1}{2}$ E.: they have numerous sand-banks on them, and are intersected by narrow deep passages. Another extensive range of reefs, probably a continuation of the former, appeared to stretch still farther to the south-eastward.

There was every appearance of a channel between these lines of reefs and Canoe cay, leading directly from Darnley, to Murray island. It has a clear entrance to the northward, between Darnley island and the Tobin reefs; but some sunken patches, with deep water between, lie to the westward of Canoe cay; from these patches to Murray island the channel has not been sounded.

Nepean islet is small, wooded, and lies W. $\frac{1}{2}$ N. nearly $5\frac{1}{2}$ miles from Darnley island, and, N. by W. $2\frac{1}{2}$ miles from Tobin cay, from which it is separated by a deep clear channel $1\frac{1}{2}$ miles wide. The islet is surrounded by a reef nearly 3 miles in circumference, which extends farthest from its northern side. Being uninhabited, this is a convenient spot for cutting firewood.

A narrow shoal, 5 miles long North and South, lies about 3 miles to the westward of Nepean islet and Tobin cay. There is deep water between it and these islets; but from 2 to 3 miles to the westward of the shoal, is a patch of foul ground.

The space between the Great Barrier reefs and a direct line from Nepean

islet to Mount Adolphus is little known, the openings into it through the barrier not having yet been considered of sufficient consequence to render its immediate examination necessary.

Captain Flinders passed through the above space in H.M.S. *Investigator*, in 1802, and in the colonial schooner *Cumberland*, in the following year. He each time entered by Murray islands, and steered as directly as the reefs would permit, for Mount Adolphus; the first half of each track was through reefs to Half-way island, which is low, wooded, and lies about midway between Murray islands and Mount Adolphus. Between Half-way island and Mount Adolphus the water appeared comparatively clear of dangers; for the first 15 miles there were 17 and 18, to 9 fathoms, and then regular soundings in about 12 fathoms to Mount Adolphus.

Mr. Ashmore, in the ship *Ibernia*, passed through this space in 1811, his track being to the southward of those of the *Investigator* and *Cumberland*; these together with the tracks of the *Fly* and *Bramble* to the southward (*see* pages 362 and 363), appear to have afforded the only means on record, of arriving at any knowledge of this part of Torres strait.

STEPHENS ISLAND, W. by N. $\frac{1}{2}$ N. 12 miles from Darnley island, is considerably higher than the neighbouring small coral islands, the tops of the trees on it being 160 feet above the level of the sea. The island is situated on the north side of a reef which extends nearly 3 miles to the eastward and 2 miles to the westward of it; the reef is nearly 4 miles long, North and South. There is a sand-bank on its south-west point, and a 3-fathoms spit projects one mile from its north-west extreme. Some cocoa-nut trees were seen on the island, and a number of long poles erected on the reef. The inhabitants have large canoes, and bear a very ferocious and hostile character, with the Darnley and Murray islanders.

CAMPBELL ISLAND, S.W. $\frac{1}{2}$ S. $4\frac{1}{2}$ miles from Stephens island, is small, low, and wooded, with trees 105 feet high: it is surrounded by a reef, $2\frac{1}{2}$ miles long, N.E. and S.W., with a depth of 20 and 25 fathoms round it; a small detached coral patch lies close off the north-east side of the reef. There is a deep water passage half a mile wide between these reefs and the south end of Stephens island reef.

DALRYMPLE ISLAND, W. by S. $\frac{1}{2}$ S. $10\frac{1}{2}$ miles from Campbell island, is low, wooded, and one mile long; it lies on the west side of a reef $2\frac{1}{2}$ miles long and one mile broad, with deep water round it. There is a village on the eastern side of the island.

Pearce cay, a sand-bank awash at high water, lying N. by W. 6 miles from Dalrymple island, is situated on a reef 3 miles in circumference, with deep water round it. The channel between Pearce cay and Warrior reef to the westward, is deep, free from dangers, and $3\frac{1}{2}$ miles wide.

Keats islet, S.S.W. $7\frac{1}{2}$ miles from Campbell island, although very small, has trees 60 feet high growing on it; it is surrounded by a reef nearly 2 miles long, North and South, with 15 to 25 fathoms water close round it.

York islands, between 3 and 4 miles to the southward of Keats islet, are low, wooded, and connected at low water, by a sandy spit; they are situated on the northern side of a semicircular reef, 4 miles long E.N.E. and W.S.W., and nearly 2 miles broad. The larger island, which is $1\frac{1}{2}$ miles long, is on the western end of the reef, and the other, on the north-eastern extreme. From the opening between the two islands a shallow spit extends nearly a mile to the north-eastward; with this exception the water is deep close to the northern edge of the reef, but to the southward, it has not been closely examined.

MARSDEN ISLET, S.W. by W. $\frac{1}{2}$ W. 4 miles from Keats islet, is small and densely wooded, some of the trees being from 60 to 70 feet high. The island lies on the south-west end of a reef $1\frac{1}{2}$ miles long, and surrounded with deep water.

RENNEL ISLAND, nearly S.W. by W. 7 miles from Marsden islet, is low, wooded, and 2 miles in circumference; it is situated on the north-western edge of a reef $2\frac{1}{2}$ miles long East and West, and $1\frac{1}{2}$ miles broad, with from 13 to 17 fathoms water close to its edges. There is a village at the south-east extreme of the isle.

Between Rennel and York islands is a small reef, with a sand-bank on it, awash at high water, on each side of which is a clear deep channel.

Bourke islets, to the southward of Yorke isles, are small and wooded; the westernmost of these four islets, the only one bordering upon the channel, is encircled by a narrow fringe of coral, and lies nearly S.E. by S. 6 miles from Rennel island: it may be approached to depths of 19 to 25 fathoms, on all sides at a distance of half a mile. About 3 miles southward of the Bourke islets are several reefs, but they have not been examined.

Hannah bank.—A sand-bank, on which in 1876 there was a Beech-de-mer station, lies 7 miles E. by N. $\frac{1}{2}$ N. from the south-eastern Bourke island. The bank is situated near the south-western end of a reef 4 miles long, N.E. and S.W., and from 2 to $2\frac{1}{2}$ miles broad. A series of reefs extend thence towards Cancee cay, as far as the south entrance of Darnley island channel.

ARDEN ISLET, S.W. by S. 8 miles from Rennel island, is small, low, and fringed by a narrow coral reef, with deep water round it. At 2 miles to the south-westward of this islet, East Jacobus shoal was seen in 1862.

Aureed island, S.E. by E. $8\frac{1}{2}$ miles from Arden islet, is low, wooded, nearly $1\frac{1}{4}$ miles long, and like most of the neighbouring islets, is fringed with coral. There is a village near its southern end, with numerous inhabitants for so small an island, who are considered by the Darnley and Murray islanders, hostile and ferocious.

Between Arden and Aureed islands, at 3 miles from the former, is a sand and coral patch, awash at half tide; it is one mile long North and South, and has a deep, clear channel on either side of it.

A small, low wooded island lies W. by S. $\frac{1}{2}$ S. $9\frac{1}{4}$ miles from Aureed island, on the south-west end of a reef $2\frac{1}{4}$ miles long, which like the others just noticed, is steep-to on all sides. A native village was seen on the island.

DOVE ISLET, W. by S. 5 miles from the small island just described, is small, wooded, and surrounded by a reef, with deep water round it. A bright green spot at about 2 miles to the north-eastward of Dove islet, was seen by the ships *Glen Clune* and *Hermann*, and as the space immediately to the north-eastward of this spot has not been closely sounded, it should be passed with caution.

COCOA-NUT ISLAND, S.E. 4 miles from Dove islet, derives its name from a high grove of cocoa-nut trees on it; it is one mile long East and West, and very narrow, and situated on a reef 3 miles long, and about 2 miles broad, extending in the same direction as the island. Close off the east end of the reef is a small islet, also encircled by a fringe of coral; and $3\frac{1}{2}$ miles farther to the eastward, is a patch of dry rocks and sand, on a small coral reef. These three reefs are bold to approach, and there is a deep clear channel between the dry rocks and the islet just described.

A very snug boat harbour during the north-west monsoon, lies on the west side of the island, inside the reef, which can be crossed in from 3 to 4 feet at low water. There is no water on Cocoa-nut island, the natives obtain their supply from Sue islet.

H.M.S. *Sappho*, in 1878, anchored in 17 fathoms water, with Cocoa-nut island bearing E. $\frac{1}{2}$ S., and Dove islet N.N.E.

At $4\frac{1}{2}$ miles S. by W. $\frac{1}{2}$ W. from Cocoa-nut island is a small narrow islet surrounded by a reef, with deep water about it. A small reef with a sand-bank on it lies E. by N. $\frac{1}{4}$ N. $6\frac{1}{2}$ miles from this islet, and several others appeared to extend in a southerly direction for about 15 miles from the reef. Nearly 8 miles E. $\frac{1}{2}$ S. from the reef is Half-way island, a large sand-bank in the centre of a reef 4 miles long N.N.E. and S.S.W., and $1\frac{1}{2}$ miles broad. There is anchorage under the west side of this reef, sheltered from S.E. winds.

THREE SISTERS are three low and partially wooded islets in

line, N. by W. and S. by E. Bet islet—the northernmost of the three—lying S.W. by W. $\frac{3}{4}$ W. $15\frac{1}{4}$ miles from Cocoa-nut island, is situated on the west extreme of a coral reef 7 miles long, and about one mile broad. This reef is nearly straight, and has a grassy sand-bank on its east end, S.W. $\frac{1}{2}$ W., nearly 10 miles from Cocoa-nut island. A reef, on the end of which is 5 fathoms, extends about $2\frac{1}{2}$ cables off the north-west end of Bet islet.

A small reef, with a sand-bank and a few bushes on it, lies $2\frac{1}{2}$ miles to the northward of Bet islet, in line with the other Sisters. A 3-fathoms spit runs out about half a mile from its south-west side; and some rocks awash, extend $2\frac{1}{4}$ miles to the eastward of the reef; but the water is deep all round them, and they may be easily seen, in the daytime, by a proper look-out.

Sue islet—the middle Sister—lies 4 miles to the southward of Bet islet, on the north-western end of a coral reef $3\frac{1}{4}$ miles long, and from half a mile to $1\frac{1}{2}$ miles broad.

Poll islet—the southernmost of the Three Sisters—lies $2\frac{3}{4}$ miles to the southward of Sue islet, and is situated on the west end of a reef about $1\frac{1}{2}$ miles long.

WRECK SHOAL, on which in 1870, Mr. J. Farquhar, Master of the barque *Loch Awe*, reported seeing the abandoned wreck of a schooner named *Honolulu*, is said to be about $3\frac{1}{2}$ miles W. $\frac{1}{4}$ S. from Bet island. Captain Moresby, H.M.S. *Basilisk* in 1872, could not find this danger. Great caution should be observed, however, when in this locality.

Ackers shoal, discovered in 1860 by Mr. Jones, Commander of the ship *William Ackers*, lies S.W. $\frac{1}{4}$ S. 2 miles from Poll islet: it has 15 feet and probable less water on it, and appeared to be about one quarter of a mile in extent N.E. and S.W. There are 11 fathoms between this shoal and Poll islet.

Two small coral reefs lie close together, 5 miles to the southward of Poll islet and with the Three Sisters nearly in line; on the eastern and larger reef, is a sand-bank. Midway between Ackers shoal and the above coral reefs, is a shoal with apparently about $2\frac{1}{2}$ fathoms on it, with Poll islet bearing N. by E. $\frac{1}{4}$ E., the sand-bank S.E. $\frac{1}{4}$ E.

Melanie shoal, discovered by Captain Edwards of the ship *Melanie*, is a small coral patch with only 9 feet on it, and deep water round. From the shoal the sand-bank southward of Poll island bears W. by N. 3 miles distant, and Sue islet N.N.W. $\frac{1}{4}$ W.

Dutfield rock, about 9 miles S. by W. $\frac{1}{4}$ W. from the Melanie shoal, is awash at low water, and was discovered in 1876 by Captain Dutfield, who reports the rock as lying about 12 miles north-eastward

of mount Adolphus ; the position is, however, doubtful. Great care should be taken when in the neighbourhood of this reported danger.

SADDLE ISLAND, about W. by S. 8 miles from Bet islet, is $1\frac{1}{2}$ miles in circumference, and encircled by a narrow fringe of coral. It rises to two grassy hills, 180 feet high, separated by level ground, which gives the islet a saddle-like appearance, when seen from the eastward and westward. There are 8 and 9 fathoms water close to all round this islet.

MORESBY ROCK is a sunken patch of coral, lying about half a mile north-west of the course recommended for vessels passing through Torres strait by the Great North-east channel ; it is apparently of a circular shape, from 120 to 140 yards in diameter, having from 8 to 10 feet water on it at low-water spring tides. There is deep water close round this rock, which bears from the south point of Saddle island E. $\frac{1}{2}$ S. $1\frac{1}{2}$ miles. The passage between the rock and Saddle island is quite free from danger.

From the rock, Bank's peak was just open of Burke island bearing West ; Ninepin rock bore S.S.W. $\frac{1}{4}$ W., Bet island E.N.E. ; and Sue island E. by S.

Caution.—In the vicinity of this rock caution should be observed as to the set of the tide, as spring tides run at the rate of about $2\frac{1}{2}$ knots an hour ; the flood setting to the north-west, the ebb tide to the south-east.

NINE-PIN ROCK, a remarkable isolated pinnacle S. $\frac{1}{2}$ E. $3\frac{1}{2}$ miles from Saddle isle, is about 25 feet high, and resembles what it derives its name from ; the water is deep close round.

HARVEY ROCKS are a black cluster, a few feet above high water, nearly 5 miles to the southward of Nine-pin rock in line with Saddle islet. These rocks should not be approached within $1\frac{1}{2}$ miles on their north, and north-west sides, as there is a rock awash at one mile to the northward ; and a 2-fathoms patch lies about the same distance to the north-westward of them.

From Saddle island, and Nine-pin and Harvey rocks to Mount Ernest and Double island, there are regular soundings of 9 and 10 fathoms, with apparently no other shoal than a $4\frac{1}{2}$ -fathoms patch E. by S. $\frac{1}{2}$ S. $3\frac{1}{2}$ miles, and Campbell reef, S. $\frac{1}{2}$ W. 7 miles from Mount Ernest.

WESTERN SIDE of GREAT NORTH-EAST CHANNEL.—Nearly the whole of the western side of this channel is well marked by Bampton and Bristow islands, and Warrior and Dungeness reefs.

BAMPTON ISLAND, which forms the western point of the gulf of Papua, as stated in page 470, is only separated from the low mainland of New Guinea by a narrow creek.* It was not closely examined,

* See Admiralty chart of Papua, or New Guinea, Sheet 3, No. 2,423 ; scale, $\pi=0\cdot35$ of an inch.

but it appeared to be a low, thickly wooded island, from 10 to 12 miles in circumference, with trees attaining an elevation of 200 feet above the level of the sea—a height exceeding that of any other trees in the neighbourhood. A bank of rocks and sand extends nearly 4 miles in a S.S.E. direction from the south point of the island, upon which the sea breaks heavily during the south-east monsoon, as it also does upon the eastern edge of the Warrior reef. There was a native village on the north point of the island in 1845.

The natives of Bampton island are cannibals, very treacherous, and the terror of the neighbouring tribes; quite recently they murdered a number of mission teachers.*

NORTH ENTRANCE.—This entrance of the Great North-east channel is nearly 14 miles wide S.E. and N.W., between Bramble cay and the shoals extending eastward from Bampton island. As the eastern portion only of this entrance has been sounded, vessels passing through, should keep as near Bramble cay as convenient, to avoid the shallows and heavy breakers which extend from Bampton island.

BRISTOW ISLAND, 9 miles south-westward of, and about the same size as Bampton island, is low, covered with mangroves, and separated from the mainland of New Guinea by a shallow mud-flat, 2 or 3 miles broad, with a low islet in the centre: this flat dries at low water, admitting of no passage along the coast, to the westward, except for canoes, or perhaps a vessel of light draught, at high water.

The space between Bampton and Bristow islands is a shallow flat, and between the latter island and the northern extreme of the Warrior reef, is a bight occupied by shoals and foul ground. These shallows being what may be considered a lee shore, during the greater part of the year, are dangerous to approach, on account of the heavy rollers which set in, and break with great violence.

WARRIOR REEFS.—From some dry rocks, 5 miles to the southward of Bristow island, the eastern edge of these extensive coral reefs trends about 8 miles south-eastward, and then curves gently southward for 5 miles; from 3 to 6 miles eastward of the southern end of the curve are two detached reefs, each having a sand-bank, covered at high water, one N. $\frac{1}{2}$ E. and the other N. by E. $\frac{1}{2}$ E. distant 9 miles from Pearce cay. The edge of Warrior reef next takes a S.S.W. direction for 32 miles to its south extreme, and is steep-to throughout, with apparently no outlying dangers southward of Pearce cay.

On the north-east side of the reef, between the sand-banks before mentioned and Bristow island, are two rocks just below water, and lying from $1\frac{1}{2}$ to 2 miles off the edge of the reef, and 3 and 8 miles N.W. by N.

* Rev. W. Gill. London Missionary Society, 1874.

respectively from the western sand-bank. The bight formed between Bristow island and the north end of the reef has extremely irregular depths, and a mud and sand-bank which dries at low water extends partly across from the west end of the island to the reef.

The Warrior reefs are divided into two parts by the Moon pass, half a mile wide and dangerous; the south reef, on the north part of which is a sand-bank covered at high water, is 17 miles long and about $2\frac{1}{2}$ miles broad. The northern reef is about $18\frac{1}{2}$ miles long, North and South, and from $5\frac{1}{2}$ to 10 miles broad. At the north end of the north reef there is a deep passage in which the tides run at the rate of 5 knots at springs. From the north edge of this passage to the coast there is a large flat of sand, mud, and mangroves, having shallow passages.

The western edge of the Warrior reefs was traced by H.M.S. *Basilisk* in 1874, and less water was found near the reefs than on the east side. Between the reefs and Saibai island off the coast of New Guinea is a large space not yet examined, except in the north part, where there is an island covered with mangroves about 3 miles in extent, and about $1\frac{1}{4}$ miles westward of the island is a sand-bank with a rocky shoal, on which is $2\frac{1}{2}$ fathoms, extending 2 miles to the south-west. A series of coral reefs, dry at low water, and shoals with channels between extend from the sand-bank to the coast.

WARRIOR ISLAND is a small sandy cay on the centre of a crescent-shaped reef 3 miles long N.N.W. and S.S.E., and from one to 2 miles broad; it is separated from the south-west side of the extreme of south Warrior reef by a narrow boat channel. There is a large populous village on the southern part of the island, the houses being merely sheds, made of branches and leaves: with some high bush to the northward, and on the north-west end of the island is a pearl-shell fishing station; an immense quantity of shell is procured from the Warrior reef. The water supply is bad, and during the dry season, all drinkable water has to be brought from Turtle-backed island. The reef off the north-west end of the island extends from $1\frac{1}{4}$ to $1\frac{1}{2}$ miles from the shore, with a depth of $4\frac{1}{2}$ fathoms alongside the edge.

This islet derives its name from the daring hostility of its inhabitants, who, in 1792, attacked in their canoes H.M. Ships *Providence* and *Assistant*, under the command of Captain Bligh.*

A coral reef surmounted by a sand-bank, which is awash at low water, lies W.N.W. $2\frac{1}{2}$ miles from the north end of Warrior island. The reef is a mile long N.N.W. and S.S.E. There are also two small rocks nearly awash and almost in line N. by W., 8 and $9\frac{1}{2}$ miles respectively from Warrior island.

* Captain Flinders' *Terra Australis*, Introduction, p. xxv.

Anchorage for communicating with the pearl-shell fishing station on Warrior island is off the north-west end of the island. *H.M.S. Basilisk* in 1872 anchored here in $5\frac{1}{2}$ fathoms.

Tidal bank, nearly 4 miles north-west of the north end of Warrior island, has very irregular soundings over it, the least depth obtained was 6 feet at low water springs. From the bank the south-east point of Turtle Back island bore S.W. $\frac{3}{4}$ S., Cap island S.W. by W. $\frac{1}{2}$ W. westerly, and Brothers Hills peak W. $\frac{1}{2}$ S.

Approaching Warrior island from the westward, great caution must be exercised, as the flood tide through Basilisk pass sets directly over Tidal bank.

DUNGENESS ISLAND and REEF.—This island, the east point of which lies S.S.W. 4 miles from Warrior island, is flat, swampy, and thickly covered with wood; it is nearly 3 miles long, East and West, and about $1\frac{1}{4}$ miles broad. Its north and west shores are skirted by a border of coral from half to one mile broad; but from its south side Dungeness reef extends 12 miles to the southward, terminating in a point, projecting to the eastward, on which are some patches of dry sand at low water. The east side of the reef, which is generally well-defined and steep-to, extends 5 miles to the eastward from a line between the island and the southern point of the reef. At about midway, a 4-fathoms mud-spit runs out about a mile from the east edge of the reef; and at N.N.E. $\frac{1}{2}$ E. 4 miles from the spit, the West Jacobus shoal was discovered in 1862.

The west side of Dungeness reef is very irregular, consisting of indentations, projecting points, and detached coral patches and rocks. A channel, with from 2 to 5 fathoms water, appears to run through the northern part of the reef, in a S.S.W. direction, from $1\frac{1}{4}$ miles south-eastward of the east point of the island.

At about 5 miles to the southward of Dungeness island is a shoal, between which and a bight in the western side of the reef, a vessel may find anchorage in about 5 fathoms.

Basilisk pass lying between the reefs off Warrior and Dungeness islands, is about $1\frac{1}{2}$ miles broad, deep, and free from all danger, except a coral patch, awash at high water, $1\frac{1}{2}$ miles North of Dungeness island. The ebb tide prevented from escaping to the eastward by the great Warrior reef is forced through this pass with considerable velocity, running during spring tides fully 5 knots. The south-east monsoon blowing against the tide raises a confused and (for a small craft) dangerous sea. The flood tide settling to the north-west does not run so strongly. Vessels approaching Warrior island from the northward of Dungeness should beware, directly they open the pass, of the tide rushing through.

The holding ground in the pass is stiff mud. H.M.S. *Basilisk* rode comfortably with 7 shackles of chain, the tide running 4 knots.

Long island, the south-eastern point of which lies N.N.E. $\frac{1}{4}$ E. 6 miles from Bet islet,—the northernmost of the Three Sisters,—is low, swampy, and densely wooded, it is $3\frac{1}{2}$ miles long, N.W. by W. and S.E. by E. and about $1\frac{1}{4}$ miles broad at its centre. A reef, with a number of small mangrove islets scattered over it, extends 2 miles to the northward and eastward from the island, and nearly joins Dungeness reef; the north side of the reef has deep water close to.

Its south-west side is skirted by a narrow border of coral, which may be approached in 9 and 10 fathoms water, to the distance of three-quarters of a mile.

Turtle-backed island (*Yama*), N.N.W. $\frac{1}{4}$ W. $7\frac{1}{2}$ miles from the north-west end of Long island, is irregularly-shaped and about 3 miles in extent; it rises to an elevation of 270 feet, and is encircled by a narrow fringe of coral. The island is of granitic formation, and very thickly wooded, well grassed and watered; a few native huts, shrouded by coconut trees, were found on the north side, but the inhabitants, who have their head-quarters at Brothers Hills island, had concealed themselves in the bush, and avoided all communication with H.M.S. *Fly*, during her visit, in 1845. Plantains, a species of yam, and bamboo were seen growing in cleared places, and in one spot the resemblance of a small flower garden showed a step towards civilization. The island was traversed by numerous paths, and the marks of an axe or some other sharp instrument were seen on the forest trees.

TIDES.—It is high-water full and change, at Turtle-Backed island, at 12 h. 15 m.; springs rise 10 feet.

Cap islet (*Mooquar*), N.W. 5 miles from Turtle-backed island, is a rounded mass of granite, nearly half a mile long, and 285 feet high; it is scantily vegetated in some parts, and is fringed by a narrow belt of coral, with a sandy spit on its north-west side, where a small native encampment was seen in 1845, the inhabitants are not permanent.

Brothers Hills island (*Gabba*), with two hills on it, lies $5\frac{1}{2}$ miles N.W. $\frac{1}{4}$ W. from Cap islet; it is nearly two miles long N.W. by W. $\frac{1}{4}$ W. and S.E. by E. $\frac{1}{4}$ E., and one mile broad. The south side of the island is fringed by a narrow belt of coral, and off the east and west ends, the reef projects nearly one mile from the shore. Anchorage may be had northward of the reef off the west end in from 6 to 7 fathoms water.

About 4 miles N. by E. $\frac{1}{4}$ E. from Brothers Hills island, is Nicholls cay, a sand-bank about half a mile in diameter, and awash at low water.

Mourilyan reef, dry at half flood, is about $3\frac{1}{2}$ miles long East

and West, and $1\frac{1}{4}$ miles broad; it lies S.S.W. $1\frac{1}{2}$ miles from Brother Hills island, the passage between having from 6 to 8 fathoms water, with Slade rock, awash at high water, on the north side of it.

From the west end of Mourilyan reef, the west peak of Brothers Hill island bore N.E. $\frac{1}{2}$ N., and from the east end N.N.W. $\frac{1}{2}$ W.

Hastings reef, about 150 to 200 yards in diameter dries at low water springs; from it Cap islet bears E. $\frac{1}{2}$ N., and west point of Brothers Hills island N.E. $\frac{1}{2}$ N. 6 miles distant.

The GREAT NORTH-EAST CHANNEL extends S.W. $\frac{1}{4}$ S. nearly 100 miles in a direct line from Bramble cay, in its north-east entrance, to Harvey rock, the south-westernmost termination of the chain of islands extending through the channel. Its greatest breadth is about 35 miles, at its north-east entrance, between Anchor cay and the shoal water eastward of Bampton island, and its least breadth is between Dungeness reef and a patch of dry rock and sand 12 miles to the south-eastward of the reef.

The Great North-east channel being comparatively free from hidden dangers, and so much broader than any hitherto discovered, both in entering from the eastward, and afterwards gaining the mainland of Australia, or the western channels through Torres strait, a vessel has the advantage of being enabled to run through it under all sail, with a leading wind during either monsoon. If clear, and the wind be steady, a great part of it may be passed through at night, as then the white sandy beaches, in strong contrast with the dark foliage of the numerous islands, render them good guiding marks. Should the weather become squally, or the objects be indistinct, anchorage may be found anywhere in the channel, especially under the lee of the islets and reefs. In the broad space between Bligh entrance and Warrior reef, and that to the northward of mount Adolphus, a vessel might heave to during the night, if proper precaution be observed, and so wait for daylight to pursue her passage through the more intricate parts.

Another strong recommendation to the Great North-east channel, is its southerly direction from the eastward, enabling a vessel to push on at all hours of the day, unembarrassed by the sun's glare; this, and the direction of the channel also admitting of a passage either way, with a free wind, or nearly so, in either monsoon, besides other great advantages, render this channel unquestionably the best adapted for general navigation, more especially for a ship of great draught, fleets, or convoys.

To vessels which, from stress of weather, or strong currents, have been driven to leeward of Raine island, or Pandora entrance, and vessels from the Pacific, it is obviously the route. It is questionable, however, if at present it will supersede the Raine island, and other southern passages,

although only lengthening the route to cape York about 130 miles, prejudice being so much in favour of the southern channels.

Natives.—Nearly all the islands in the Great North-east channel are inhabited, or visited by the natives, who are very numerous; and as they are possessed of, and well skilled in the management of large canoes, with a perfect knowledge of the navigation of Torres strait, and being a warlike and treacherous race, small vessels should be on their guard against surprise, and boats should on no account land without being armed, and under the immediate protection of the vessel.

Missionaries have now been working amongst these islands for some years, and a considerable trade has also sprung up; this appears to have worked a great change for the better in the character of the natives. Captain J. Moresby, H.M.S. *Basilisk*, who spent some months in Torres straits in 1873, writes as follows:—"The Torres strait islanders are well acquainted with white men, and are friendly disposed towards them; the Pearl shell, and Beech-de-mer traders having worked amongst them for six years, and occupied stations on many of the islands.

"Solitary white men live in security on the islands for months at a time, with quantities of trade and other articles, of great value to the natives, often not protected by either a lock or key.

"No danger need now to be apprehended from these islanders as long as their domestic rights are respected."

The coral islets possess no other fresh water than what may be collected from the rain, in small holes made by the natives; and not always can Darnley island be depended upon for a supply, as has already been observed; but at this, and the Murray islands, yams, plantains, and cocoanuts may be procured from the natives; and most of the islanders have a fair stock of good tortoise shell, which they are ready to barter for hatchets, knives, and other European wares.

SOUNDINGS.—The chief characteristics of the Great North-east channel consist in the regularity of the soundings, the uniformity of the bottom, and comparative absence of hidden dangers, not only within the channel, but also in approaching it from the Coral sea.

From the northern part of Portlock reefs to Bligh entrance, the depth gradually decreases from 60 to 30 fathoms, the chief variation in the regularity of the soundings being to the northward of East and Anchor cays, where the depth increases from 45 to 63 fathoms.

From Bramble cay to Stephens island, the average depth is about 22 fathoms, generally decreasing to 9, 8, and 7 fathoms, in the direction of Bampton island and Warrior reef.

From Stephens, to Warrior island, the soundings decrease from about 18

to 12 fathoms, the deeper side of the channel being to the eastward, where from 18 to 25 fathoms may occasionally be met with.

From Warrior island to the entrance of Endeavour strait, and for nearly 25 miles across that space, the bottom, in most parts consisting of coral sand and shells, is remarkably even, the depth gradually decreasing from 12 to 9 fathoms, to the southward and westward.

The bottom throughout the Great North-east channel generally consists of coral-sand and shells, although there are a few patches of mud.

DIRECTIONS for the GREAT NORTH-EAST CHANNEL.—A vessel going through Bligh entrance from the southward and eastward, should endeavour to make the entrance on the parallel of about $9^{\circ} 5'$ S., passing to the northward of East and Anchor cays, and by the time she gets into about 25 fathoms, Darnley island will, in clear weather, be distinctly seen to the southward; and Bramble cay, from aloft, to the northward. It will be desirable not to make Bligh entrance to the southward of this parallel, in consequence of the sunken reefs lying 5 and 7 miles to the northward of the vegetated sand-bank, north-eastward of Darnley island; and vessels proceeding to Darnley island from the northward must keep a good look-out for these dangers.

Darnley island and Bramble cay, or either of them, having been identified, and the vessel's position ascertained, a south-westerly course may be steered for Stephen's island, which will soon be seen in that direction; when it is clearly made out, alter course if necessary, so as to pass at about 3 miles to the north-westward of it. Having cleared the spit of foul ground running out W.S.W. 3 miles from Stephens isle, steer S. W. $\frac{1}{2}$ S., towards Rennel isle, distant 20 miles, passing $3\frac{1}{2}$ miles to the north-westward of Campbell isle, and between Dalrymple and Marsden isles; pass Rennel isle on the western side, at a distance of about $1\frac{1}{2}$ miles, then haul up to S.S.W. $\frac{1}{2}$ W., towards the west end of Cocoa-nut isle, distant 21 miles, leaving Arden island and Jacobus East shoal at about a mile on the port beam, and passing between Dove islet, with the Green patch to the north-eastward of it, and another low islet to the eastward of Dove islet. Cocoa-nut island will soon be seen from aloft, and is easily distinguished from its neighbours, by the grove of cocoa-nut trees growing upon it, *see* page 374.

When at about 2 miles to the westward of Cocoa-nut island, and there is sufficient daylight to pass between the Sisters and Long island—supposing it is intended to go through Prince of Wales channel—the next course will be S.W. by W. $\frac{1}{2}$ W., for Bet islet, the northernmost of the Three Sisters, distant $13\frac{1}{2}$ miles; by making good this course, the south-east points of Dungeness and Long island reefs will be passed at a distance of about $1\frac{1}{2}$ miles, the only hidden danger in the route being the

reported Jacobus East shoal and the patch of sunken rocks 3 miles to the north-eastward of Bet islet, which must be carefully looked out for; the latter may be avoided by keeping Mount Ernest island its breadth open to the southward of Saddle island.

Bet island may be passed at about a mile off its north-west side, from thence a S.W. $\frac{1}{2}$ W. course should be made good until Saddle island bears N.W. by W., to clear Moresby rock. The tidal stream in the vicinity of this rock must be carefully observed, as it runs strongly at right angles to the course. Nine-pin rock may be passed on either side; then steer S.W. $\frac{1}{2}$ S. 19 miles for Double island, which in clear weather will soon be seen from aloft; pass this island on its northern side, taking care to give a good berth to the spit of foul ground running out to the north-westward from the west end of its reef.

From Double island, Wednesday and Hammond islands will plainly point out the entrance of Prince of Wales channel, for which a W.S.W. course may now be steered, and directions for farther guidance through the channel, to the westward, will be found at page 342.

If, on arriving at Cocoa-nut island, it is intended to proceed to cape York, or Endeavour strait, a S.S.W. $\frac{1}{2}$ W. course may be shaped for mount Adolphus, passing about midway between the low islet, lying S.S.W $4\frac{1}{2}$ miles from Cocoa-nut island, and the grassy sand-bank on the east end of Bet reef. The east side of the sand bank lying 5 miles southward of Poll islet should then be passed about a mile off, and mount Adolphus, which will now be distinctly seen, may be steered for, care being taken to keep a sharp look out for the Melanie shoal and Dutfield rock, see page 375; pass either to the northward or southward of the islands according to the vessel's destination.

In the last part of these directions, from Cocoa-nut island to Mount Adolphus islands, the route passes through a space as yet but very slightly examined, the greatest caution should therefore be exercised.

Night.—To vessels entering the Greet North-east channel from the eastward late in the day, it is preferable to anchor on the north-west side of Bramble cay, rather than to stand on after dark for anchorage under Stephen's island, where the water is deeper, and the holding ground not so good. Should the vessel proceed on through the channel, it would be desirable to deviate a little to the eastward from the direct course between Stephens and Rennel islands, so as to sight Campbell and Marsden islets, as it is advisable to borrow a little on the south-east side of the channel here, to avoid being set by a lee tide stream too near the Warrior reef, which might happen at night, whilst steering a given course for above 20 miles, without any land-mark in sight for the greater part of the distance.

If arriving near Cocoa-nut island at nightfall, it would be better to anchor than attempt to pass between Long island and the Sisters; but should anchoring for the night cause an inconvenient delay, the eastern track, direct from Cocoa-nut island to Mount Adolphus islands, passing to the eastward of the Sisters reefs, might be adopted, but it would be attended with great risk, see page 384. In this case it would be desirable to haul on a wind, on the port tack, after passing the grassy sand-bank, on the east end of Bet reef, to avoid the two reefs with the sand-bank, southward of Poll islet. And if the wind hang to the southward of S.E., a short board to the north-eastward may be desirable to counteract the strong westerly set which generally prevails, independently of the tide streams in some parts of Torres strait during the south-east monsoon.

In following the foregoing courses, due allowance must always be made for the tide streams, and the additional set to the westward, before alluded to.

It is deemed quite unnecessary to give separate directions for proceeding through the Great North-east channel from the westward, as those already detailed for coming from the eastward, taken in inverse order, will answer every purpose. An exception must be made when approaching Nine-pin rock, which should be passed on the east side, and a N.E. course made good, until the south end of Saddle island bears West, the Moresby rock will then be cleared.

Although the Great North-East channel is so comparatively free from dangers, an anchor should at all times be ready to let go, and a good lookout kept from aloft.

TIDES.—It is high water, full and change, at the north-east entrance of the Great North-east channel, at 9h. 20m.; springs rise from 10 to 12 feet. At its south-western termination, from Mount Adolphus to Turtle Backed island, it is high water, full and change, at 12h. 15m.; springs rise 10 feet.

The streams in the Great North-east channel are in great measure governed by its direction, and their velocity by the narrowness of the passages through which they run.

Between Mount Adolphus and Saddle island the flood stream sets to the westward, and the ebb to the eastward, $1\frac{1}{2}$ knots at springs.

At about mid-channel, between Dungeness reef and Stephens isle, the Warrior reef diverts the streams into a south-westerly and north-easterly direction: the flood runs till 11h. 30m. The average rise and fall does not exceed 10 feet all over the channel, at springs, when at low water all the reefs are left uncovered. In this part of the channel $1\frac{1}{2}$ or 2 knots may be allowed for, at springs.

In the neighbourhood of Bramble cay, and in the south part of Bligh

entrance, the flood and ebb resume a westerly and easterly direction, running $1\frac{1}{2}$ knots at springs; the flood runs till 11h. 15m. The neap tides are comparatively little, both in range and velocity.

The streams are often diverted by a reef or an islet, and their strength is much increased in narrow channels; but generally speaking they may be considered regular. See Caution, page 376. Mr. Kennedy, Master of the ship *Medway*, in May 1860, experienced a westerly or lee current all the way from Bramble cay to Cocoa-nut island, but not so strong as between the Three Sisters, where he believes it must have run at least 3 knots in a W.N.W. direction.

It is worthy of remark that the rise and fall of tides in the Great North-east channel, cause a remarkable difference in the appearance of its islets and reefs, which might perplex those who are unacquainted with the circumstance. At high water, the islets are marked close to the line where vegetation begins, except in the more elevated, where the white sandy beaches intervene; the reefs which encircle the islets are then only discernible by the discoloured appearance of the water, which in certain states of the atmosphere affords by no means an infallible indication. The reefs at low water stand out as solid masses, with banks of sand and black rocks (negro heads) scattered over them, and appearing to cover an area greater than is the case; thus rendering the navigation of the same locality, under these different circumstances, worthy of due attention. To this cause may be traced, in all probability, many of the various conflicting accounts which prevail, of the numerous dangers in coral seas.

CHAPTER VII.

WINDS AND CURRENTS.—DIRECTIONS FOR THE INNER ROUTE
BETWEEN SYDNEY AND TORRES STRAIT.

THE east coast of Australia, with respect to winds and currents, requires a division, the part to the southward of the tropic of Capricorn being placed under different, and almost opposite circumstances, to that within, or close to it.

The prevailing winds on the eastern coast of Australia between Sydney and Sandy cape are from the N.E. in summer and from the westward in winter. Very oppressive hot N.W. winds occasionally blow fiercely during the summer months, and are invariably followed (after subsiding somewhat) by a sudden squall from the southward, against which ships should be prepared, as the first gust is generally of a violent character and apt to occasion damage, unless due precautions have been taken. The effect of these sudden changes are so great on the atmosphere, that the thermometer has been known to descend at port Jackson from 100° to 64° in less than half an hour.

Besides the sudden changes alluded to from N.W. to southward, a change from N.E. to South is often met with during the summer months, and generally happens after some days' continuance of north-east winds. As a rule these changes can be foreseen by clouds rising to the southward with lightning; sometimes, however, very little warning is given, and the change takes place with a cloudless sky.

Southerly winds are more frequent during the winter than in the summer months; but occasionally they blow three or four successive days in the latter mentioned season; the southerly wind is inclined to draw off the land in a direction S.W. or even W.S.W. in the night time, especially during the winter months, and is invariably found to have more westing in it the nearer a vessel approaches the land.

In winter, from May to September, there are frequent westerly winds, with fine weather; the gales at this season blow from the seaward, between N.E. and South, and bring rain; nor is there any settled weather in winter with sea winds, and even when between North and N.W. there is often rain, though the wind is usually light in those quarters.

Land and sea breezes are not frequent, but are met with occasionally during the spring and autumn months; in the height of summer season the north-east wind springs up from a calm in the early forenoon, and subsides about midnight, a slight draught off the land being occasionally felt close in shore between these intervals.

A heavy dew in the night is invariably an indication of a north-east wind the following day.

The N.E. or sea breeze is subject to variations of strength and character. Sometimes it blows a steady gale for three or four days, veering from North to N.E. in squalls. When likely to be of this duration it sets in with thick, overcast weather; and increasing in strength, is accompanied with gloomy dense clouds and heavy rain, and an atmosphere so thick, that objects during the squalls are not distinguishable more than one-quarter of a mile off. The barometer gives little or no indication of these gales, and is not affected during their continuance.

Easterly gales occur but seldom, yet from the scarcity of harbours on the coast are much dreaded by coasters; their worst feature is that they are often unsteady in direction, veering from E.N.E. to E.S.E. in squalls. A well appointed ship, however, can generally maintain an offing by keeping on the starboard tack; thereby bringing the current, which almost always sets to the southward, on her lee bow. June, July, and sometimes August are the months in which these gales are felt in their full violence.

The rotary gales, experienced between December and April in the vicinity of Howe and Norfolk islands, occasionally occur on this coast by springing up from the northward and eastward and blowing hard by the time they have veered round as far as N.W.; at N.W. the gale is generally at its highest, and the barometer at its lowest; usually the shift to S.W. takes place in a heavy rain squall, but sometimes, however, the shift is gradual. By the time the wind has obtained a S.W. direction, the barometer begins to rise, and soon after the wind veers to the southward, and eventually gives off from the southward and eastward with a high barometer.

The Barometer on the east coast, to the southward of the tropic, is of great value when combined with local experience. If the weather be tolerably fine, and the mercury does not stand above 30 inches, there is no probability of danger; but when it exceeds this elevation and begins to fall, while the weather is becoming thick, a gale is to be apprehended, and a vessel should immediately obtain a good offing. It may be taken as a general rule upon this coast, that a rise in the barometer indicates either an increase of the wind, which at the time may be blowing, or that it will veer more to seaward; and a fall denotes less wind, or a breeze more off the land. The barometer rises highest with a S.E. wind, and falls lowest with a N.W. wind; and N.E. and S.W. are points of mean height.

A falling barometer, with dirty weather from the S.E., is the precursor of a circular storm travelling from the N.E. The wind commences at S.E. and will shift to the East and N.E., when the weather will clear up and be

followed by a fine N.W. wind off the land. One of these storms was experienced in the neighbourhood of port Denison on the 3d and 4th March 1867, doing much damage. Another storm passed north of Brisbane on 27th and 28th April 1867, when the barometer fell from 29·90 in. to 29·80 in. in four hours, wind increasing from E.S.E., with very thick squally weather; it continued to fall for sixteen hours, when it was 29·27 in., blowing a very heavy gale from the eastward; the gale then shifted to North, and the barometer commenced rising; for sixteen hours it blew from the north in squalls, force 2 to 7, after which the gale passed off leaving the barometer standing at about 29·70 in., with fine weather and wind blowing from the N.W.

These latter observations were made by Commander G. S. Nares, H.M.S. *Salamander*, 1867, whilst at anchor under the lee of Moreton island.

Whilst the wind blows from various quarters on the southern parts of the east coast, the south-east trade prevails with more regularity within, and close to the tropic, and generally blows home to the coast, from April to September, producing in some places land and sea breezes near the shore, with fine weather, which lasts longest as cape York is approached. Although the south-east trade may generally be considered steady, between the tropic and Torres strait, from April to early in September, H.M.S. *Bramble* experienced violent gales in the months of March and May, in the vicinity of the tropic. During Captain Denham's survey of the Coral sea, he experienced some heavy gales, and found the south-east trade frequently interrupted by variable winds and calms.

During the north-west monsoon, from November to March, the winds on the east coast, to the northward of Sandy cape, are variable, but generally light from the northward and westward, with occasional calms, rain and clear weather; but during this season violent gales frequently blow accompanied by rain, thunder, and lightning.

The westerly winds appear to become more steady as they leave the coast, the greatest distance they have been known to extend being about 500 miles, to the eastward of cape Flattery, or nearly to the meridian of 150° E., where they are succeeded by south-east or easterly breezes.

In all the coast districts the rainfall is great, being about 50 inches at Brisbane and Rockhampton, while at Rockingham bay it is 90 inches.*

CURRENTS.—The current between the months of September and April almost constantly sets to the southward along the coast between Sydney and Sandy cape, its influence being first felt at about 12 miles north-east of the latter place, and has been found on several occasions to set strongest during a south-east gale. During these months, however, the southerly current will sometimes cease and set northerly, but

* "Australasia." A. R. Wallace, 1879.

it only lasts a day or two, and may be attributed to local causes, such as strong southerly winds for some days. Between port Stephens and the coast to the southward of Sydney, it sometimes sets towards the land. In a gale from S.E. in the month of December, it was found setting as much to the westward as S.W. This should be attended to, particularly in south-easterly gales, and an offing preserved to provide against the winds veering to E.S.E. and E. by S., which is often the case; and then, in a dark night, the lee current will place the vessel in considerable danger. In the winter season the current is neither as regular nor as strong as during the summer.

The rate of current is very irregular, varying from one to 3 knots; it extends about 50 or 60 miles off the land, the greatest strength being found near the projecting points and just on the edge of the soundings extending from 10 to 30 miles from the shore. Off Danger point it has been known to set nearly 4 knots per hour to the southward.

The outer part of this southerly current, when about abreast of port Stephens, curves to the eastward and E.N.E., sometimes running with great velocity, it having been known to attain a strength of 100 miles in a day; eastward of Howe island it quickly loses its strength.* Abreast of Sydney the outer part of the same current will be found diverted from its course, to a south-east and easterly direction as it leaves the land, the strength being from one to 2 miles per hour. Close in with the shore in the bights, especially north of cape Moreton, there is generally an eddy setting to the northward, from one quarter of a knot to one knot per hour.

The outer part of this current was found by H.M.S. *Pearl* completely reversed, and to run strongly in the opposite direction.†

Within the Great Barrier reefs, it is not the current so much as the tide streams which demand attention, and these have already been described, or are marked on the charts.

In the Coral sea, Captain Denham generally experienced little or no current in the Outer route, until within 50 or 60 miles of the Great Barrier reefs, in the direction of Torres strait; there a north-westerly current becomes perceptible, which increases as the barrier is approached, and generally follows the direction of the trade to the north-westward, its strength partly depending upon that of the wind.

* See Admiralty current chart, Pacific, Atlantic, and Indian oceans, No. 2,840. Published October 1872.

† Captain Lindsay Brine, H.M.S. *Pearl*, in his remark book for 1877 says:—"We left Sydney for Auckland on the 17th January 1877, and on the 18th found we had experienced a current of N. 66 W. 29'; the next two days it ran N. 64 W. 24'. Thus in three days the ship had been set 123 miles to the westward, while in the latitude of 34° S., and until 200 miles off the coast. On the 21st, in longitude 150° 30' E., the current set E.S.E. 21 miles. The weather during this period was moderate, and the prevailing winds were from E.N.E. to S.E."

REMARKS ON THE INNER AND OUTER ROUTES FROM SYDNEY TO TORRES STRAIT.

Vessels from New South Wales, bound to any of the ports in India during the south-east monsoon—that is, from the month of April to August, inclusive—will find it more advantageous to pass by Torres strait, taking care to be through by the end of August, as at that time of the year strong westerly winds prevail on the southern coasts of Australia, rendering a passage to the westward, round cape Leeuwin, the south-west point of Australia, impracticable, unless in a powerful steamer, or in a fast and well found sailing vessel.

In proceeding by Torres strait, two passages present themselves—one called the Inner route, or along the eastern shores of Australia, within the Great Barrier reefs, entering it by the Curtis or Capricorn channels. The other, known as the Outer route, by stretching off to the eastward of the Great Barrier reefs, steering between them and the Chesterfield reef and islands, as far north as Mellish reef, then through the Coral sea, entering Torres strait by Raine island or Bligh entrance, or by either of the various other openings in the Great Barrier reefs, to the northward of cape Melville.

MERITS of the TWO ROUTES.—Opinions have been divided as to the respective merits of the two passages: for despatch, the Outer route is certainly to be preferred; but, before the numerous out-lying dangers in the Coral sea were surveyed by Captain Denham, the Inner route was generally considered the safest.

A fair passage by the Inner route, from the time of leaving Sydney to passing Booby island, may be considered as occupying from 25 to 30 days; and that by the Outer route, about 20 days. Captain King, however, did not believe there was so much time to be gained by the Outer route, as in the introduction to his Sailing Directions for the Inner route, printed by himself, in 1843, for private distribution, he says:—"The prejudice has been so great, that the generality of masters of ships, bound through Torres strait, preferred the risk and anxieties of the outer passage to the safer, and far more agreeable one within the Barrier reefs; supposing that one or two days in the length of the run might be saved, thus placing life and property in jeopardy, for the sake of an advantage which, even at best, is questionable; for the shortest passage from Sydney to Booby island, that has come within my knowledge, was made by H.M.S. *Rattlesnake* and two merchant ships, which cleared Booby island on the twelfth day from leaving Sydney.

"Another objection that has been made to the Inner route—and it is the only tangible one—is 'the trouble of anchoring every night;' but even

this, with attention and common experience, and by following either of my two outer tracks, may be lessened, for no ship need be anchored until she arrives at cape Grafton, particularly if the passage be made between the first and last quarters of the moon. The anchor will then have to be dropped four or five, or at most, six times ; but in smooth water, under the lee of islands or reefs on a muddy bottom, and in no way exposed until the track joins that taken by ships entering the 'Barrier,' and in which they have to anchor at least twice ; the first time being in deep water, and exposed to a strong wind and a swell, which never happens in the Inner Route, for in most cases, between cape Grafton and the junction of the two tracks, a light anchor may be used, with the necessary precaution of keeping a bower anchor ready to let go, if the wind should freshen so much as to require it."

The Inner route being now tolerable lighted and beacons placed on the most dangerous reefs, is always used by the various mail steamers passing through Prince of Wales channel, on their route to and from Sydney, Queensland, and the various ports on the coast.

The season for making the passage by either route is from early in April to the middle of August ; it is not desirable to be up with the entrance of Torres strait before the beginning of April, in order to avoid the chance of an equinoctial gale, as well as to make sure of the south-east monsoon being well set in in the Arafura sea. Vessels have left Sydney as late as October, and made their passages, yet generally speaking it is much too late, for although the north-west monsoon does not blow home until November, and sometimes later, the calms and light variable winds that precede it protract the passage very much.

Large sailing vessels seldom navigate the Inner route now, its use being nearly confined to the various steamers running between Singapore and China and the east coast of Australia, and to the coasting trade. See page 403.

DIRECTIONS FOR THE INNER ROUTE, FROM SYDNEY TO TORRES STRAIT.

In proceeding to the northward from Sydney, the charts will be a sufficient guide, so that it does not seem necessary to lay down any particular directions, until the vessel has sighted or reached the neighbourhood of Sandy cape. The prevailing wind on this part of the coast blowing from nearly an opposite quarter in summer to what it does in winter, the navigator will use his own discretion in getting to the northward against the strong southerly current generally running along the coast. As the great strength of this current is found on the edge of the line of soundings,

at from 10 to 30 miles from the coast by keeping well outside this line there will not be much difficulty. (*See* page 390.)*

The mariner must remember that the Curtis and Capricorn channels are the only entrances into the Inner route from the south-eastward, and that nothing would justify him in attempting a passage through the Great Barrier reefs, the outer edge of which between the Swain reefs and cape Grafton, has never been traced. The *Wunsfell* succeeded in passing through the Great Barrier, but it must have been at great risk of life and property.

Having carefully avoided Sandy cape shoal, at about 11 miles to the north-eastward of the cape, and having cleared Breaksea spit, Curtis and Capricorn channels both present to themselves as entrances into the Inner route, but the latter, described at pages 197, 394, is the most direct and free from dangers.

Caution.—All the sand-banks on the reefs in the Inner route that are without vegetation are liable to shift; therefore complete dependence cannot be placed on them as sea marks. They are sometimes seen well above high water, and on again passing in a month's time, the sand having been distributed over the reef, the bank is scarcely seen, even at low water.†

CURTIS CHANNEL.—Should communication with port Curtis, or any other circumstance, induce a vessel to enter the Inner route by this channel, which is described at page 196, the first care after clearing Sandy cape shoal, will be to round Breaksea spit, in not less than 8 fathoms water, when a W. by N. course may be steered towards port Curtis, passing at about 6 miles to the southward of Lady Elliot islet.

If Breaksea spit be rounded in the evening, the same course should be steered, taking care to pass 5 or 6 miles south of the light on Lady Elliot islet, thence steer for Bustard head, the light on which is to be seen 24 miles distant; pass well outside Outer rock $2\frac{1}{2}$ miles northward of the head, and then proceed as directed at page 125. It must be remembered in passing through this channel that the tidal streams between Lady Elliot islet and Breaksea spit run about S.S.W. and N.N.E., while northward of Bustard head its direction is eastward and westward.

In proceeding to the northward from port Curtis, cape Capricorn should be passed at a distance of about 8 or 10 miles, taking care to

* *See* Admiralty charts of Australia :—General charts, No. 2759*a* and *b*, scale, $d = 1\cdot0$ inch : east coast of New South Wales, port Jackson to Danger point, Nos. 1,021, 1,024, 1,025, 1,027, and 1,028; scale, $m = 0\cdot5$ inch : east coast of Queensland, Danger point to Magnetic island, No. 1,029; scale, $m = 0\cdot5$ inch, No. 1,068; scale, $m = 0\cdot3$ inch, and Nos. 345, 346, 347, and 348; scale, $m = 0\cdot25$ inch : Coral sea and Great Barrier reefs, sheet 1, lat. 26° to cape Grafton, No. 2,673; scale, $m = 0\cdot04$ of an inch.

† Commander G. S. Nares, H.M.S. *Salamander*, 1867.

avoid Rock Cod shoal at 11 miles S.S.W. $\frac{1}{4}$ W. from Mast-head island, and also Irving rock 5 miles to the westward from the island; then keep outside the islets and rocks in Keppel bay; Flat and Peaked islets off cape Manifold; and the Hervey islets, to the northward of port Bowen. Pass between Cheviot and Steep islands avoiding Low and Hannah rocks, then proceed to the westward between the Percy isles and Sail rock. In thick weather or night it would perhaps be prudent to heave to under easy sail until daylight. The best anchorage hereabout is on the west side of No. 2 Percy island, but the bottom is in some cases rocky; there will, however, be little necessity for anchoring off this part of the coast, as convenient spots may be selected for standing off and on, or heaving to, through the night, should the weather not be favourable for running.

There are several high hills along the coast, of which the most conspicuous are the High peaks behind cape Manifold, and mount Westall to the north-westward of port Bowen: these, with the numerous high islets near the route, form good guiding marks.

From the west side of No. 2 Percy isle, a N.W. by W. $\frac{1}{4}$ W. course for 36 miles, will take a vessel to Prudhoe isle, passing eastward of Enterprize reef, about one mile to the north-eastward of the Beverly group, and 2 miles to the westward of Double isle. Pass Prudhoe isle—which is high and bold-to—on its east side, and then steer N.W. $\frac{1}{4}$ W. for cape Conway, the west side of the entrance of Whitsunday passage. The greater part of this will be a smooth water-course, as it passes along the lee side of Bailey islet, l l. and m. isles, and Sir James Smith group; most of these islands, besides answering the purpose of beacons, generally afford very fair anchorage, sheltered from south-east winds. In a dark night or thick weather, when it may not be prudent to run, a vessel will find ample room to heave-to; the shoals off Shoal point being the only known dangers that demand more than ordinary attention, between Prudhoe isle and Whitsunday passage.

TIDES.—The flood south of Northumberland isles sets southward into Curtis channel, and the ebb to the northward.

From CAPE CONWAY to Gloucester island, a vessel should keep in about mid-channel through Whitsunday passage, so as to avoid the shoal extending to the northward from cape Conway, Spitfire rock, on the west side of Shaw island, and the islets and doubtful Hyacinth shoal, to the eastward of cape Gloucester; next to these dangers, the light winds and calms, caused by the high land, and the strong tide streams, demand most attention, when going through Whitsunday passage.

CAPRICORN CHANNEL.—This entrance into the Inner route being so broad and clear, the chart will be the best guide, as the channel may be entered anywhere between the parallels of $22^{\circ} 30'$ and

23° 10' S. and the meridians of 152° and 152° 30' E., when a north-westerly course may be steered, passing at about 7 miles to the eastward of High peak and the Percy isles. See page 197.

From the PERCY ISLES, the track laid down to the north-westward, on the chart should be carefully followed, leaving islets **k 1.**, **k.**, and **k. 2.** on the port hand, and the sand-banks westward of **k 4½** and **k 4.**, on the starboard hand. From abreast of **k** islet a N.W., $\frac{1}{4}$ W. course may be run for nearly 90 miles, over ground previously explored by H.M. Ships *Mermaid*, *Bathurst*, and *Rattlesnake*: pass between **1 2.** isle and the dry sand-bank, seen by Captain Flinders 13 miles to the northward of it, and then about 4 miles outside the chain of islets and rocks lying to the eastward of Whitsunday island. Most of the Cumberland islands being high and easily seen in fine weather, serve as good marks, and the northernmost island of the group being bold, may be rounded at a distance of about 2 miles; from hence steer about W. by N., for 24 miles, which will lead 6 or 8 miles to the northward of Gloucester island.

Captain King gives this outside route, from the Percy isles to Gloucester island, a decided preference to that between the Cumberland islands and the mainland, in consequence of the light and unsteady winds likely to be caused by the high islands bordering the weather side of the Inner channel especially in Whitsunday passage. The Inner channel has, however, the advantage of smooth water close to the chain of islands, which serve as beacons and afford sheltered anchorage.

From GLOUCESTER ISLAND.—From a position about 8 miles northward of Gloucester island, steer W. by N. $\frac{1}{4}$ N., for 40 miles, when cape Upstart and mount Abbot should be in line, bearing South, the cape distant 9 miles. This course will take a vessel over a well-known track, passing about 2 or 3 miles south of Nares rock lying to the southward of Holborne islet, described at page 206.

From about 10 miles northward of cape Upstart there is a clear run, N.W. by W. $\frac{1}{4}$ W. for 80 miles, over ground free from dangers, which will bring the vessel 2 or 3 miles to the eastward of the south-easternmost, and largest Palm isle.

CAUTION.—The chief occasion for more than ordinary vigilance, between cape Upstart and the Palm islands, is when passing cape Bowling-green, which is very low, and although it has a revolving light on it visible 14 miles, ought not to be approached without great caution, and not nearer than in 11 fathoms water: an indraught also sets into Upstart bay, which must be guarded against. See page 209. In approaching the Palm isles, a good look-out must be kept for the Chilcott rocks only 5 feet above water, lying S.E. 2 miles from the south-east end of Great Palm island.

In shaping the various courses to the north-eastward, due allowance must be made for the tide streams, and also for a prevailing north-westerly set, of one to 3 knots, according to the breadth of the channel.

The Palm isles, being bold to approach, a vessel should run along their eastern sides, at a distance of about 3 miles to avoid the doubtful Zebra shoal, and another said to be 2 miles S.S.W. of it.

From the PALM ISLES.—From a position 3 miles eastward of Pelorus isle (North Palm) a direct N.N.W. $\frac{1}{2}$ W. course for 35 miles, will lead in mid-channel, to abreast of the Family islands, passing about midway between Brooke islands and Kennedy shoal. The Palm, Brooke, Family, and Dunk islands form a continuous chain of land-marks for this part of the coast.*

When about 6 or 8 miles to the eastward of the Family islands, with Brooke island bearing S. $\frac{1}{2}$ W., and the south-east summit of Dunk W. by N., a vessel may steer N.N.W. a little westerly for 66 miles, which will bring her to the channel between cape Grafton and Fitzroy island, passing $1\frac{1}{2}$ miles to the eastward of the outer North Barnard islet, and midway between No. II. and High Frankland islands.†

The most prominent dangers to be guarded against are the King reefs, and the shoals fronting Cooper point and the coast several miles north and south of it, which extend from $1\frac{1}{2}$ to 2 miles off. See pages 232, 233. Dunk island, the Barnard group, Cooper point, and the Frankland and Fitzroy islands, form a succession of marks to guide a vessel at night.

From CAPE GRAFTON.—Having passed between cape Grafton and Fitzroy island, or outside the latter—as most convenient—and being at about one mile to the eastward of the south-east point of the cape, the course will be N.W. $\frac{1}{4}$ N. for 45 miles, to about $1\frac{1}{2}$ miles eastward of Snapper island, passing between the Satellite rock, with 2 fathoms on it, and the Low isles, for the latter of which a good look-out must be kept at night, as they will not be seen until close-to.

When Snapper island bears about West distant $1\frac{1}{2}$ miles, the course should be altered to N. by W. for 13 miles, which will lead $1\frac{1}{2}$ miles outside cape Tribulation, after which the vessel may steer N. by W. $\frac{3}{4}$ W. 21 miles, so as to pass between the Hope islands and the detached a. reef to the north-westward of them.‡

* See Admiralty chart of Australia, east coast sheet xv., No. 2,349; scale, $m = 0.25$ of an inch; and Coral sea and Great Barrier reefs, cape Grafton to Torres strait, No. 2,674; scale, $m = 0.04$ of an inch.

† See Admiralty chart of Australia, east coast, sheet xvi., No. 2,350; scale, $m = 0.25$ of an inch.

‡ See Admiralty chart of Australia, east coast, sheet xvii., No. 2,351; scale, $m = 0.25$ of an inch.

In making a direct course from cape Grafton to Snapper isle, no leading marks can be given, as the Low isles are too small and low to be seen at any great distance. At night it will be better to skirt Trinity bay, so as to take advantage of such marks as may be distinguished, without keeping too near the shore; but great care must be taken to avoid the dangerous spit projecting to the south-eastward of Island point.

From HOPE ISLES.—In the daytime a vessel being midway between south-west Hope islands and *a.* reef, marked with a red beacon, may steer N. by W. $\frac{3}{4}$ W. for $8\frac{1}{2}$ miles, keeping a sharp look out for Scott rock, nearly awash, and lying about 3 miles S.E. of *c.* reef; then N. $\frac{1}{2}$ W. 17 miles, passing $1\frac{1}{4}$ miles eastward of *c.* reef beacon, and $1\frac{1}{2}$ miles westward of the beacon on *e.* reef. This course will bring the vessel to about one mile eastward of cape Bedford, whence steer N. $\frac{1}{4}$ E. between Low wooded island and Three isles; after which cape Flattery being clearly seen, shape a North, a little westerly, course for Lizard island, passing at about $1\frac{1}{4}$ miles westward of Two isles, and between cape Flattery and Rocky islets, with the shallow patches extending 4 miles southward of them.

By NIGHT from CAPE TRIBULATION to LIZARD ISLAND.—In a clear night a vessel may safely run this distance by leaving cape Tribulation at $1\frac{1}{4}$ miles, and the north point of Weary bay about one mile to the westward, and by keeping the mainland on board in proceeding to the northward, as far as Monkhouse point; not however approaching the land within a mile. Along this part of the coast, the high land of mount Thomas, Rocky islet, and Walker hill are good guiding marks.

After passing the shoal water skirting the shore from Rocky islet to Walker point, edge in towards Monkhouse point, to clear *d.* reef, with its red beacon, taking care at the same time to avoid the shoal projecting from the bay between Walker and Monkhouse points. *See* page 243. When between Monkhouse point and *d.* reef, steer N. by E. easterly, to pass at about one mile outside cape Bedford, from thence proceed towards Conical rock, and from between it and Low-wooded isle shape a N. $\frac{1}{2}$ E. course for Lizard island, keeping at about $1\frac{1}{4}$ miles outside cape Flattery, which can be seen some distance off.

From LIZARD ISLAND.—Having clearly made out Lizard island, which is high and easily seen, pass midway between the shoal projecting to the south-westward from it, and the eastern edge of Eagle islet reef.*

* *See* Admiralty chart of Australia, east coast, sheet xviii., No. 2,352; scale, $m = 0\cdot25$ of an inch.

When in line between Eagle islet and the north point of Lizard island, steer W. $\frac{1}{2}$ N. for about $25\frac{1}{2}$ miles, passing not less than $1\frac{1}{2}$ miles north of n. islet, to avoid the shoal spit off the north side. On nearing No. 3 island, Howick group, a good look-out must be kept for the Harrington rock, $1\frac{1}{2}$ miles southward of it, but when the high peak of No. 1, Howick group, bears North, a vessel will be clear of the rock and may alter course to pass between the beacon on the rock outside r. reef and No. 4, Howick group.

From abreast of VI. Howick island, proceed towards Barrow point, which is moderately high, until Brown peak is seen just open west of Noble isle, bearing S.E. by S., which marks being kept in line, will lead clear of danger, past Barrow point, from whence steer N.W. by N., keeping in from 9 to 12 fathoms, to clear the shoal skirting the coast from Barrow point to cape Melville; continue this course until the Boulder rock off cape Melville comes open of the east extreme of the cape. When the Pipon islets and reef, with a black beacon on its southern end are visible, steer about midway between the beacon and the dangerous Channel rock, which is generally awash.

By Night.—Nearly the same courses and directions given for the daytime will serve for proceeding by night from Lizard island towards cape Melville, provided it be clear and fine, by keeping a good look-out for the low islets just mentioned, which are not visible until close-to. Should these not be recognized, or if there be any doubt about the vessel's position, she should come to, in the anchorage nearest at hand.

INSHORE PASSAGES by LOOK-OUT POINT.

Vessels proceeding by the route between No. 1 reef, which is usually dry and is marked by a red beacon, and Look-out point, should, in order to clear the east side of the shoal north of cape Flattery and the foul ground south of No. 1 reef, keep capes Bedford and Flattery in line until High rock is seen between South Direction island and Rocky islets (wooded); then steer West until the north-western of the Two isles—low and wooded—touches cape Flattery; then alter course for Look-out point, passing about a mile outside of it, or midway between the point and sand-bank.

Round hill kept on with "End of Range" westward of it clears the north extreme of shoal ground on the north side of Look-out point; when Look-out point comes in line with the north peak of cape Flattery, keep it so, and this mark will lead up to Howick group.

There appears to be a good channel between No. 1 reef and No. III. reef (covered), but great caution would be necessary in passing through, as it requires to be examined.

TIDES.—In the narrow part of the channel, from Barrow point to cape Melville, between the coast and w. reef, the streams run with great rapidity, for which due allowance must be made.

From CAPE MELVILLE.—When midway between Pipon reef and Channel rock, steer W. by N. $\frac{1}{2}$ N., and passing about half a mile northward of Low Woody isle, alter course to W. by S. $\frac{1}{4}$ S. and proceed at the same distance southward of Clack islet, which is very conspicuous; continue W. by S. $\frac{1}{4}$ S. towards *d.* reef, taking care not to approach *b.* reef, within half a mile, to avoid the spit $1\frac{1}{2}$ miles westward of Clack islet.

When the beacon on *d.* reef bears South, alter course to N.W. by W. $\frac{3}{4}$ W., passing between *e.* and *f.* reefs on the port side, and *c.* *g.* and *h.* reefs on the starboard side, the four former reefs being marked by beacons; continue this course until Pelican islet is seen well open to the westward of the beacon on *i.* islet, and No. 1 Claremont island bears N.W. $\frac{3}{4}$ W. Now steer N.W. by N. for 17 miles, passing nearly midway between No. II. Claremont island and the black beacon on *m.* reef; a good look-out must be kept for a shoal patch reported by Mr. Chilcott to exist W. by S. $\frac{1}{2}$ S. $3\frac{1}{2}$ miles from *n.* sand-bank, as noticed in foot note at page 273.

Having brought No. III. Claremont island to bear S.W. by W. $\frac{1}{2}$ W., alter course so as to lead between Nos. IV. and V. Claremont islands, and about $1\frac{1}{2}$ miles to the westward of the beacon on the south end of No. VI. reef; and when a little to the westward of the light-vessel moored off No. VI. reef keep away N.N.W. westerly, passing more than a mile eastward of the beacon on the Heath rocks, and at a distance of 4 to 5 miles from cape Sidmouth.

By Night.—From cape Melville towards cape Sidmouth, it will be necessary to avoid the reefs as much as possible, and take every advantage of such high objects as may be distinguished: therefore after passing Channel rock, steer W. by S., for Castle hill, the east extreme of the north Flinders isle, taking care to avoid *a.* shoal, between Castle hill and Low Woody isle. When cape Flinders, the north extreme of the group, bears W. by N., and Flinders peak S. by W., alter course to pass half a mile North of the cape, then steer W. by S. $\frac{3}{4}$ S. for 20 miles, taking care not to get into less than 7 fathoms water.

A vessel having made good this course and distance will be in mid-channel between *d.* reef and the Cliff isles, and about 2 miles northward of the dangerous Wilkingen reef (page 269), she should then steer towards No. I. Claremont island, and keep in 7 fathoms water altering course as requisite, and the lead will guide the ship directly towards the island,* when it is seen alter course to pass at about one mile to the westward of it and of No. II. Claremont island, then, if the night be not nearly ended, it will be prudent to anchor, and wait for daylight, to proceed to the northward, as before directed.

* Commander G. S. Nares, H.M.S. *Salamander*, 1867.

In this night route great caution must be observed in approaching Wilkingen and *f.* reefs, of which the lead will give no warning; but the gradual shoaling of the water indicates the approach to the mainland.

Great care should be taken to counteract the strong tide streams, which set across the route between Flinders group and Pelican islet.*

Should No. I. Claremont island not be visible or easily identified when nearing it, a vessel should at once come to, as there is safe anchorage in from 7 to 9 fathoms water.

From CAPE SIDMOUTH.—Having shaped a N.N.W. westerly course from the light-vessel off No. VI. reef, continue on it for about $19\frac{1}{2}$ miles, which will bring the vessel to about three-quarters of a mile to the eastward of the north end of Night island, passing in mid-channel, between the black beacon on No. VII. reef and the shoals extending to the north-eastward from cape Sidmouth; if the weather be sufficiently clear for High Round hill to be visible, its peak kept well open to the eastward of No. VIII. islet, leads just clear of these shoals. Keep at least 2 miles to the eastward of No. VIII. islet to avoid the Chilcott rocks which are awash and marked by a beacon, and lie a little more than one mile eastward of the islet.†

When at about three-quarters of a mile to the eastward of the north extreme of Night islet, steer North towards the beacon on *v.* reef, leaving *tt.* reef beacon on the starboard hand; keep close to the west side of *v.* reef, to avoid Dugdale rock, on which there is but 4 feet water. Then steer N. by W. a little westerly, to nearly half a mile westward of No. X. islet and reef passing at about half a mile to the westward of Sherrard islets. The next course will be N. $\frac{1}{2}$ W., to pass one mile to the westward of *y.* reef, marked by a black beacon, to clear the Lansdown reef projecting from cape Direction. See page 277.

From abreast of *y.* reef nearly a direct N.W. $\frac{3}{4}$ N. course may be steered for 41 miles, passing one mile to the eastward of the high rock off cape Weymouth; the same distance eastward of the spit running out to the north-eastward from the north end of Middle reef, the south end of which has a beacon on it; $1\frac{1}{2}$ miles to the westward of the dry rocks and beacon on the north-west extreme of *o.* reef; nearly the same distance to the westward of the beacon on the south end of *h.* reef; and midway between the light-vessel off the north end of *i.* reef and the reef enclosing the eastern Piper islets, the east extreme of which is marked by a red beacon.

From half a mile off the light-vessel steer N. $\frac{1}{2}$ W., to pass between Young islet, with a beacon on it, and *m.* reef, which latter also has a

* See Commander Robinson's remarks, page 271.

† See Admiralty chart of Australia, east coast, sheet xix., No. 2,353; scale, $m = 0.25$ of an inch.

beacon on it, and has a sand-bank, always dry, on its northern extreme, taking great care to avoid a rock awash at low water, lying about one mile S.E. $\frac{1}{4}$ S. from Young islet. Pass one mile to the westward of *m.* sand-bank, after which a N.N.E. $\frac{1}{4}$ E. course will take the vessel midway between Haggerstone and Home islands. In steering this course great care must be taken to make due allowance for the strong current, which sweeps to the north-westward round the Home islands and cape Grenville.

By Night.—The Inner route from cape Sidmouth to cape Grenville being in many parts very narrow, and bounded by coral reefs, and the points of the mainland, which with the only exception of Restoration island, are too remote from the vessel's route to be useful as guiding-marks at night, it would be very hazardous to navigate this part at such time or in thick weather. If, however, it be deemed necessary to attempt it at all hazards, and the night be clear and fine, the courses by day, already given, are the best that can be suggested, assisted as they now are by beacons on the most dangerous reefs, and two light-vessels marking the most difficult part of the route. Should the reefs not be clearly made out at a distance of about 2 miles, the anchor ought to be immediately dropped, in whatever channel the vessel may be.

The Anchorages between capes Melville and Grenville are so numerous as to require no particular mention. The north-west side of nearly every reef will afford shelter; but the anchor should not be let go too near them, because the tide stream sweeps round the edge with greater strength than it does half a mile off, and the water is generally deeper. If the day be advanced and the breeze fresh, Night island should not be passed, because the anchorages between it and Piper islands are rather exposed, and a vessel getting under way from Night island at daylight, will easily reach Piper islands or Margaret bay before dark.

From CAPE GRENVILLE.—After rounding the Home islands, steer N.W. $\frac{1}{4}$ W. 29 miles, passing at about $1\frac{1}{2}$ miles to the eastward of the Bird islands. The Hannibal islets will be in line when the vessel is about midway between the reef that surrounds them, and *v.* reef, on the north-west end of which is a beacon: proceed from this position N. by W. $\frac{1}{4}$ W. for about 27 miles, passing about 2 miles to the westward of Half-way islet, and midway between Caincross and Bushy islets. In running the latter course great caution must be observed in passing Pearn reef, lying nearly 2 miles S.S.W. $\frac{1}{4}$ W. of Half-way islet.*

When Cairncross islet bears S.E. by S. and No. 3 Woody islet E. by N., alter course to N.N.W. $\frac{3}{4}$ W. towards X. and Z. reefs. This course will lead $1\frac{1}{2}$ miles outside Gilmore bank, and about one mile outside the shoal water projecting from Tern islet. Pass at about three-quarters of a mile

* See Admiralty chart of Australia, east coast, sheet xx., No. 2,354; scale, $m = 0.25$ of an inch.

to the westward of X. reef, with a beacon on its north end, and at least one mile west of the beacon on the west end of Z. reef, to clear the spit off that end of the reef; when the beacon bears East alter course for Mai islet, and pass about half a mile westward of the Harrington and England shoals, which dangers must be carefully watched for, proceed on the same course until the south-east end of Albany island bears West, the vessel will then be north of England shoal and may alter course to pass between Albany rock and the Brothers.

For PORT ALBANY.—Vessels bound for port Albany, by the southern entrance may proceed from Z. reef as directed at page 299, where also will be found directions for entering Albany pass from the northward.

Resuming the Inner route towards cape York, a vessel from Z. reef, should continue the N.N.W. $\frac{3}{4}$ W. course to about midway between Albany rock and the Three Brothers, which together with mount Adolphus, cape York, and the neighbouring islands, should now be distinctly visible.*

For YORK ROAD and EVANS BAY or for BLACKWOOD BAY.—Having passed the Three Brothers a vessel may proceed into York road or Evans bay, cape York, by the directions given at page 302; or into Blackwood bay, Mount Adolphus islands, as directed at page 304.

For ENDEAVOUR STRAIT.—A vessel having arrived at a position between cape York and mount Adolphus, and cleared the dangerous Mid rock—which lies nearly midway between cape York and mount Adolphus—may be said to have completed the navigation of the Inner route, and if bound to the westward through Torres strait, may proceed through Endeavour strait, as directed at page 329, or by the far better route through Prince of Wales channel.†

For PRINCE of WALES CHANNEL.—Having cleared Mid rock, steer about N.W. by W. $\frac{1}{2}$ W. for a. rock, which is a conspicuous mark, and may be passed on either side, at the distance of half a mile. From a. rock continue the same course, and pass well outside Strait rock, and the rock awash, to the northward of it, Tuesday islets and the shoal patch lying half a mile to the northward of Tuesday reef; round Ince point, and proceed through Prince of Wales channel, according to the directions already given at page 342.

* See Admiralty plan of port Albany, No. 1,937; scale, $m = 2.0$ inches.

† See Admiralty chart, Torres strait, sheet I, Western channels, No. 2,357; scale, $m = 0.5$ of an inch.

When nearing Strait rock a good look-out must be kept for Edwards rock, which is said to be very small, with 6 feet water on it, and to lie nearly 2 miles southward of East Strait islet.

INNER ROUTE FROM TORRES STRAIT TO SYDNEY.

Vessels bound from India to Sydney generally go to the westward of Australia, and round cape Leeuwin, which, according to some authorities, is by far the most safe and expeditious route; whilst others assert that the eastern route is practicable from November till February; but it does not appear that until H.M.S. *Bramble* tried the experiment in 1845, a passage by a sailing vessel was ever accomplished from Torres strait to Sydney by the Inner route. On that occasion the undertaking was commenced near Darnley island, in the month of April, and prosecuted against the full force of the south-east monsoon as far as Sandy cape, when variable winds and generally a southerly current near the land, rendered the concluding part of the voyage comparatively easy, the whole passage having been accomplished in 90 days.

On the second occasion the *Bramble* left cape York for Sydney at the latter end of the month of November, when the winds were as much in her favour as against her, so that the passage to Sydney was performed in 40 days, exclusive, as on the former occasion, of delays resulting from surveying operations.

Generally speaking, as already observed, it will be better, for a sailing vessel, to proceed from India to Sydney westward, by cape Leeuwin; but being anywhere near the north coast of Australia, in the north-west monsoon, from November to February or March, the Inner or Outer route may be adopted with advantage.

Steamers bound from Singapore and China to the east coast of Australia, generally use the Inner route at all times of the year, insuring as it does smooth water for the greater part of the passage; the numerous beacons recently placed on the reefs, together with the two light-vessels at the most dangerous parts of the route, also tends to give comparative safety when combined with care and attention in navigation.

DIRECTIONS.—In proceeding to the southward from cape York, the directions and courses given for going northward may be followed in the inverse order, whenever the wind will permit; but in beating against a foul wind, much must be left to the discretion of the navigator, who should in that case take advantage of every eddy caused by the indentations of the mainland, or the smooth water under the lee of the extensive reefs between cape York and Sandy cape.

It would seem hardly necessary to recommend that those parts of the Inner route not sounded, as shown in the charts, must be traversed with more than ordinary caution; the vessel's course should if possible never be in the glare of the sun, and an anchor ought always to be in readiness to let go.

In selecting an anchorage for the night, or when unable to make any progress against a south-east gale in the summer months, a vessel should anchor far enough off the north-west side of an island or reef, to enable her to clear it on either tack, in case the wind suddenly chops round, and blows from the opposite quarter with great violence, which it frequently does at this season of the year.

In continuing the voyage from Sandy cape to Sydney the vessel should keep near the coast but outside the bights, to take advantage of the current, which generally sets to the southward, in some places, from one to 3 knots. To use a common expression of the masters of the Sydney coasting vessels, the land should never be allowed to *dip*, when working to the southward. See page 389.

CHAPTER VIII.

OUTER ROUTE FROM SYDNEY TO TORRES STRAIT, WITH THE OUT-
LYING ISLANDS AND REEFS OFF THE EAST COAST OF AUSTRALIA,
AND IN THE CORAL SEA; ALSO ROUTES BETWEEN AUSTRALIA
AND CHINA.

VARIATION IN 1879.

Middleton reef -	11° 0' E.	Kenn reef -	-	-	9° 05' E.
Lihou reef	- 7° 50' E.	Bramble cay	-	-	5° 05' E.

ALTHOUGH the former, and by far the greater, portion of this volume has been devoted to the description of the East coast and Inner route, from Sydney to Torres strait, the present chapter, on the Outer route, is much more likely to interest most of the commanders of merchant vessels proceeding from Sydney to Torres strait, whose chief object is generally to make a quick passage with the least amount of labour.

The Outer route no doubt possesses these advantages; but it must be borne in mind that the passage through the Great Barrier reefs, from the Coral sea into Torres strait, is frequently attended with danger, and sometimes the loss of the vessel. These disasters, however, would doubtless be less frequent were the Great North-east channel more used, as it may be mostly navigated by night, so that the time and labour saved by not being compelled to anchor so frequently as in the route by Raine island, would more than compensate for the 90 miles, which the former route exceeds the latter in distance.

The chief objection to the Great North-east channel used formerly to arise from the approach to it by the recommended track, from lat. 15° 30' S., long. 152° E., having been less frequented than by that to Raine island; but as it has been partially traversed by H.M.S. *Herald*, and is now generally used by the few sailing vessels passing through Torres strait, its navigation appears to be far less hazardous than making Raine island or either of the passages southward of it through the Great Barrier reefs.

Before deciding upon the course to be pursued, the navigator, especially if a stranger to the east coast of Australia, is recommended to read the remarks on the respective merits of the Outer and Inner routes, discussed in the last chapter, page 391.

Notwithstanding all that has been said in favour of the Inner route, supported by the weighty authority of Captain P. P. King, the Outer

route is unquestionably preferred by nearly all the merchant vessels bound from Sydney to Torres strait: it is therefore the object of the present chapter to give a clear description of the dangers through which the Outer route passes, and directions for the seamen's guidance.

The Admiralty charts of the Coral sea afford at a glance the best view of the Outer route, from the parallel of Sandy cape to Torres strait, and if a vessel proceeding to the northward crosses that parallel at about the meridian of 157° E., and cautiously follows the given courses on the charts which lead through the most frequented part of the Outer route, there will not be much cause for anxiety before reaching the Great North-east channel described at and for which directions are given at pages 381-386; or before making the Great Barrier reefs, which may be considered the most critical part of the voyage, and for which ample directions will be given in the latter part of this chapter.*

It is desirable that the navigator should have all the dangers and directions connected with the Outer route unfolded consecutively to his view, in the present chapter, without distracting his attention more than necessary by reference to other parts of the work, where the Great Barrier reefs have been described with the coasts to which they naturally belong. The outer edge of the barrier will therefore again be briefly noticed, with a description of the most practicable openings through it, for a vessel to enter, in proceeding from the Outer route into Torres strait; but before entering upon the description of the Coral sea, it will be necessary to notice the outlying islands and reefs off the east coast, between the parallel of Sydney and the tropic of Capricorn.

LORD HOWE ISLAND, belonging to New South Wales, is the southernmost of the outlying islands and reefs off the east coast of Australia, it is mountainous and of volcanic origin but well wooded, and much of the low land is fertile. Mount Gower, the highest part of the island, rises abruptly from its southern end, to an elevation of 2,840 feet. The island, which forms an irregular curve, slightly bending to the eastward, is about $5\frac{1}{2}$ miles long N.N.W. and S.S.E. and from one-third of a mile to $1\frac{1}{2}$ miles broad. The eastern side consists of several bays; and the greater portion of the west side is fronted by coral reefs, between which and the shore are shallow lagoons, with not more than sufficient depth of water for boats, or other small craft, drawing from 3 to 5 feet. In the month of September, when the tides are at the lowest, a person may wade across the lagoon, from the shore to Goat island.†

* See Admiralty charts of the Coral sea and Great Barrier reefs of Australia, Sandy cape to Torres strait, sheets 1 and 2, Nos. 2,763 and 2,764; scale, $m = 0.04$ of an inch.

† See Admiralty plan of Lord Howe island and Ball's Pyramid, with views, No. 350; scale, $m = 8.0$ inches, and 0.75 of an inch.

Off the north end of Lord Howe island are the Admiralty islets, the northern of which is distant $1\frac{1}{4}$ miles, and the southern nearly half a mile from Lord Howe island. There are several other islets: namely, the Sugarloaf, close to the north point; Mutton Bird islet, 265 feet high, 6 cables from the shore on the east side; Goat islet, inside the reef on the west side; and Gower islet close off the south point of the island.

Between the southern islet of the Admiralty group and the foul ground extending one cable off Sugarloaf islet is a deep water passage, 2 cables wide. Balls Pyramid in line with eastern bluffs of Lord Howe island bearing S.E. leads through.

Besides the above islets, there is the Wolfe rock 3 feet above high water, and surrounded by foul ground, lying a little more than one mile S.E. from Mutton Bird islet; also Phillip rock awash, $1\frac{1}{4}$ cables off the middle bluff at the north-west end of the island, and George rock of the same character and distance from the shore, 7 cables north-eastward of Gower islet.

Lord Howe island, and the islets just mentioned, are surrounded by a bank of soundings extending from 3 to 5 miles off the west side, and from 7 to 10 miles from the other parts of the island.

Anchorage.—Although there is a moderate depth of water, at a convenient distance from the island, the anchorage cannot be considered good, in consequence of foul ground, and of sudden and violent shifting gales. In south-west gales there is anchorage in the North-east roadstead in from 10 to 16 fathoms, on very foul ground off Middle beach; in fine weather in 6 fathoms, sand. When north-east and east gales blow, there is anchorage in 10 fathoms in the South-west roadstead, on the west side of the island, sheltered by Intermediate hill, but the squalls come down with great violence. These anchorages should only be attempted by a steam vessel during the winter months, taking the precaution to keep the fires banked. Sailing vessels should anchor in such a position as to clear the land on either tack, in case the wind set in. Captain Denham's spot of observation at Middle beach, lies in lat. $31^{\circ} 31' 38''$ S., long. $159^{\circ} 5' 58''$ E.

Supplies.—Lord Howe island is inhabited by settlers, numbering 40 in 1877. Pigs, goats, poultry, and vegetables are procurable at a moderate price. Wild pigs and goats are numerous; and fish may be caught in abundance round the island.

The island being covered with wood, a plentiful supply of fuel as well as trees fit for timber may be obtained. Water is most plentiful at the south end, and may be had all through the year, at other parts of the island. In Boat harbour, on the eastern side of the island, good water bubbles through the shingle, filtered from the impurities taken up in its course down from the hills.

Caution.—Ships approaching the south-eastern part of the island within $1\frac{1}{2}$ miles, will run a risk of being dismasted (if the wind is off shore), as the gusts come down from the mountains with great violence, alternating with dead calms.

Winds and Weather.—When the mountains of Lord Howe island are capped with clouds, a north-west wind may be expected. The north-east, is a summer wind; but in a thunder-storm, it often suddenly changes to South or S.W., and as quickly regains its easterly direction. During the winter months the wind commonly ranges the whole western half of the compass, but that from S.W. is the most prevalent, and from May till September, often blows violently.

TIDES.—It is high water, full and change, at Lord Howe island, at 8h. 30m.; the average rise is about 6 feet. The ebb stream begins at high water, and the flood at low water by the shore.

BALL'S PYRAMID, S.E. by E. $12\frac{1}{2}$ miles from the south point of Lord Howe island, is a remarkable peak, rising abruptly to the height of 1,816 feet, from a rocky islet a little more than half a mile long and one quarter of a mile wide.

Wheatsheaf and Observation Rocks lie about half a mile to the westward of Ball's Pyramid; the former is 191 feet, and the latter to the northward of the Wheatsheaf, 70 feet high. Close to the eastward of each is a lower rock; and $2\frac{1}{2}$ miles S.E. $\frac{1}{2}$ E. of the Pyramid is South-east rock, 26 feet high.

Ball's Pyramid and the rocks near it are, like Lord Howe island, surrounded by a bank of soundings, extending from 2 to $5\frac{1}{2}$ miles to the westward, and from 5 to 7 miles in other directions from the Pyramid. Temporary anchorage may be found near Ball's Pyramid in fine weather; but it affords little or no shelter, and no convenient landing-place, on account of the swell.

ELIZABETH REEF.—This dangerous coral reef, which has proved fatal to many vessels, was discovered in 1820 by the ships *Claudine* and *Marquis of Hastings*, it is oval-shaped, about $4\frac{1}{2}$ miles long, East and West, and 3 miles broad, the edges of it, with the exception of a few rocks, are covered at high water. The centre of the reef is in lat. $29^{\circ} 56'$ S., long. $159^{\circ} 4\frac{1}{2}'$ E., or nearly 300 miles eastward of cape Byron, the nearest part of New South Wales, and 90 miles N. by W. from Lord Howe island. It thus lies near the route of vessels bound from port Jackson and Newcastle by the Middle route to China; and to the northern Pacific ports of America.

The reef is circular and encloses a central lagoon. According to the observations of Lieutenant G. E. Richards, R.N., H.M.S. *Renard*, who

surveyed it in February 1876, the reef uncovers at half tide, and at high water with easterly and south-easterly winds there is but little break on the western and north-western sides. From the mast-head of a vessel the reef might under other and more favourable circumstances be seen about 5 miles distant; but vessels approaching the reef from the westward should be cautious, especially in the forenoon when the sun would be ahead and thus prevent the breakers on the eastern and far-side being distinguished until the vessel was too close to avoid danger. On the north-west side of the reef is a sand-bank which covers at high water.

Within a distance of half a mile soundings varying from 40 to 55 fathoms will be found, thence shoaling towards the reef, except to the north-west of the sand-bank where the 20 fathoms-line of soundings is a mile from the reef. Outside the limits mentioned the soundings deepen quickly to no bottom at 100 fathoms.

Life-boat.—The Colonial Government of New South Wales in 1871 caused a life-boat to be moored in the lagoon of Elizabeth reef, for the purpose of succouring those wrecked on that danger. At the time of Lieutenant Richards' visit the boat was found moored in 5 fathoms, in a small sheltered basin formed by coral patches; it is provided with necessary articles for making a voyage to the Australian continent, including provisions, medical stores, chart and compass, &c. Six casks of fresh water (each containing 15 gallons) are fitted as ballast as well as for use. It is requested that the following instructions be observed, viz. :—

That shipwrecked mariners will write a detailed account of their disaster, with the names of the survivors and those lost, also the place they intend to make for; this document is to be deposited in the nun-buoy and left floating at the moorings.

Shipwrecked persons availing themselves of the life-boat should, if the wind be from the eastward, steer from the north-west part of the reef in preference to the N.E. passage, as with such winds a heavy swell sets in, making the passage difficult and dangerous. There is a coral patch always breaking in a direct line from the boat to the entrance.

Navigators visiting the boat are requested to leave a report of their visit, with such intelligence as they may wish to communicate. If bound direct to an adjacent port, they are requested to forward any reports that may be found in the nun-buoy.

Anchorage.—There is fair anchorage in 10 to 17 fathoms, coral grit, on the north-west side of the reef about half a mile off the sand-bank, with protection from the prevailing winds, East and S.E. Abundance of fish may be caught both inside and outside the reef, and occasionally turtle.

The lagoon with the exception of the centre of the northern half is studded with coral patches most of which uncover at low water springs,

and none of the patches have more than 9 feet water at any time. In the northern part the depths are one to 3 feet, coarse white sand and coral grit. The entrance, in the north-east part of the reef, open on a S.W. $\frac{1}{2}$ S. bearing, is a cable wide at the narrowest part and has 10 fathoms at low water springs. Small vessels might anchor within the entrance in 12 to 24 feet bottom broken coral, and find shelter from all winds except N.E.: the passage is difficult and dangerous with easterly winds.

With an easterly wind boats can cross the reef at high water on either side of the sand-bank situated on the north-west side of the reef.

Current.—Elizabeth reef lies near the line of separation of two currents, one setting to the westward and the other to the eastward.* The equatorial current in the South Pacific in its progress westward strikes the east coast of New Caledonia and appears to divide into two branches, one setting north of that island and the other south. The southern branch sets north of Elizabeth reef and joins the Australian current, which after setting to the southward along the east coast of Australia as far as about the parallel of 31° S. curves round to the E.N.E. This combined current sets to the eastward at the rate of one to $1\frac{1}{2}$ knots an hour, but an instance has been recorded in which it set at the rate of $4\frac{1}{2}$ knots.

The line of separation of the westerly and easterly currents during the period May to September inclusive, or when the S.E. trade prevails in the region south-east of New Guinea, appears to pass about 50 or 60 miles north of Elizabeth reef; while from November to March, the period when the N.W. monsoon prevails, it may pass 40 or 50 miles south. The currents in the neighbourhood of Elizabeth reef are thus exceedingly variable both in strength and direction; but it is probable that from May to September the current near Elizabeth reef sets to the eastward, and from November to March to the westward.†

Lieutenant Richards observed in the month of February that along the north-west and north sides of the reef within the distance of a mile the current set to the N.E., beyond that distance there was, particularly at the time of springs, a westerly set. Along the south side the set was easterly; rate about 2 miles an hour.

TIDES.—It is high water, full and change, at Elizabeth reef at about 8h. 30m.; springs rise 8 feet, neaps 5 feet.

* See Wind and Current charts published by the Admiralty, 1872.

† H.M.S. *Acheron* in October 1851, having been sent to the assistance of a shipwrecked crew on Elizabeth reef, was set in an E.N.E. direction 37 miles in 16 hours while in the vicinity of the reef on the east side, and W.N.W. 12 miles in 10 hours while on the western side.

MIDDLETON REEF, which has the whole of its outer edge dry at low water, is crescent-shaped with the concave side facing N.W., about 5 miles long N.E. by E. and S.W. by W., and from $1\frac{1}{2}$ to 3 miles broad. The west elbow of the reef is in lat. $29^{\circ} 27' 40''$ S., long. $159^{\circ} 4' 17''$ E.*

A bank of soundings surrounds the reef, extending from one to $1\frac{1}{2}$ miles on all sides except the north, where it goes off $1\frac{1}{2}$ miles; the bottom is of grit. Anchorage is found on the north-west side of the reef between the north-east and north-west horns of the crescent; the best place is in Herald haven, about one-quarter of a mile southward of the north-west horn in 8 fathoms, where a vessel is almost surrounded by the reef.

TIDES.—It is high water, full and change, at Middleton reef at 8h. 30m.; rise 6 feet.

Capel Bank.—In 1835, H.M.S. *Hyacinth* obtained soundings of from 32 to 40 fathoms, coral and sand, in lat. $25^{\circ} 15'$ S., and long. $159^{\circ} 18'$ E. Captain Denham, R.N., could not find this bank.

Kelso Bank was discovered in 1865 by Mr. R. Black, master of the British ship *Kelso*, who thus describes it:—

“On the morning of April 20th, 1865, while looking over the side at daybreak, observed the water was discoloured, but could see the bottom quite plain. Took several casts of the lead, getting bottom from 25 to 13 fathoms, fine coral sand with red specks, small shells, and seaweed, a strong N.E. swell at the time. Could see no broken water from the deck. By observations obtained at noon I place the north end of the shoal in lat. $24^{\circ} 12'$ S.; long. $159^{\circ} 27'$ E. We sailed over it in a N.N.W. direction, for 6 or 7 miles, the bottom being distinctly seen the greater part of the time, with large stones covered with seaweed.” Mr. Ebury, master of the whaler *Adventurer*, reports that a shoal (probably part of Kelso bank), with 11 fathoms, exists in lat. $24^{\circ} 6'$ S., long. $159^{\circ} 45'$ E.

As the Kelso bank lies in a frequented track between the Australian colonies and China, the mariner's attention is called to the necessity of a vigilant look-out when in its neighbourhood; as from the general nature of the coral banks of this region shoaler water may exist, and there may be other ridges between the Kelso and Capel banks.

The surveys of Capt. Denham in the Coral sea prove that very deep water exists in the immediate neighbourhood of the Capel and Kelso banks. At 8 miles westward of the position assigned to the latter, that officer tried for bottom with 1,025 fathoms of line without success.

DOUBTFUL DANGERS.—Middleton island was described in Horsburgh's directory as being small, and lying in lat. $28^{\circ} 13'$ S., long. $160^{\circ} 31'$ E. To the northward of Middleton island, in lat. $26^{\circ} 5'$ S.,

* See Admiralty plan of Middleton reef, No. 90; scale, $m = 3.0$ inches.

long. 160° E., is said to be Favourite reef. Besides these there is said to be a rock in lat. 24° S., long. $160^{\circ} 15'$ E. And towards New Caledonia the following islands and reef, which are also considered doubtful:—an island in lat. $26^{\circ} 10'$ S., long. $163^{\circ} 12'$ E.; another island in lat. $23^{\circ} 40'$ S., long. $162^{\circ} 57'$ E.; and a reef in lat. $23^{\circ} 40'$ S., long. $164^{\circ} 10'$ E.

Although the existence of Middleton island and the Favourite reef is now considered so improbable that these supposed dangers, together with the doubtful reefs and islands mentioned above, have been expunged from the Admiralty chart, a good look-out is still desirable when passing their supposed positions.

ISLANDS AND REEFS IN THE CORAL SEA.

The CORAL SEA, or that part of the Pacific ocean off the east coast of Australia, extending between the parallel of 25° S. and Torres strait, may be considered as bounded to the north-eastward by part of New Caledonia, a line from thence to the Louisiade archipelago, and part of the southern coast of New Guinea.

The south-western boundary of the Coral sea is formed by Sandy cape and the Great Australian Barrier reefs, from the parallel of $22^{\circ} 25'$ S. to Torres strait, which have already been fully detailed with the coast from Sandy cape to Torres strait. But as the Great Barrier reefs form one of the most important features of the Coral sea, its outer edge will be briefly described in the present chapter, to warn the navigator against approaching the south-eastern portion; and to render him as familiar as possible with the openings most frequented by vessels proceeding from the Outer route into Torres strait.

The outer edge of the Great Barrier reefs extends from the southern extremity of Swain reefs, in lat. $22^{\circ} 23' 12''$ S., long. $152^{\circ} 36' 54''$ E., nearly in a N.W. $\frac{1}{4}$ N. direction for 1,000 miles, to Anchor cay, which forms the north-west extremity of the Great Barrier reefs. The greatest distance of the outer edge from the coast is about 140 miles from port Bowen, in lat. $21^{\circ} 5'$ S., or nearly abreast of cape Hillsborough; and its nearest approach is 12 miles, to the northward of cape Melville.

The water outside the barrier, to the northward of Trinity opening, in lat. $16^{\circ} 30'$ S., appeared, with few exceptions, to be fathomless close-to; *H.M.S. Fly*, however, on three or four occasions obtained soundings, the most distant being 68 fathoms, in $14^{\circ} 12'$ S., at $2\frac{3}{4}$ miles off; on no other occasion did she get bottom unless within a stone's cast of the reef.

The general appearance of the Great Barrier reefs is very similar, but a few feet rise and full of tide make a very striking alteration. At low tides the edges of the reefs are nearly level with the water, with large masses of black coral rock (those appropriately termed negro heads by

Capt. Flinders) strewed over some of them ; from atmospheric refraction, these appear much larger than they really are.

At all times of tide a heavy sea rolls on the windward side of the barrier, causing a very heavy surf, the spray and vapour arising from which impart a peculiar haze to the atmosphere in the vicinity.

None of these reefs can be classed with those called lagoon ; they are extensive shallows, and on a calm clear day, at low water, a strip of the lightest green may be traced as far as the eye can reach, showing the trend of the reef, with occasionally small winding streaks of very deep blue, clearly pointing out the passages.

There are several small sand-banks on various parts of the Great Barrier, many of which are covered at high water, and others at half tide ; few were seen exceeding 5 or 6 feet in height, at high water, and a still smaller proportion produced any kind of vegetation.

The Great Barrier reefs may be seen in clear weather at a distance of 4 miles from a vessel's deck, and 6 or 7 miles from the mast-head. With a careful look-out and a commanding breeze, no vessel need ever run into trouble ; but at night more than ordinary caution is required, as it is scarcely possible to see the reefs at a greater distance than half a mile.

The sand-banks are seldom visible (in consequence of the haze over the reefs) until some time after the breakers are seen. It is at first difficult to discern what may be considered a good opening in the barrier, as, from the points of the entrance often overlapping each other, they are not clearly made out until directly abreast of the passage ; and from seaward the reefs, together with such openings, present one unvaried line of breakers.

From the southern extreme of Swain reefs, the position of which has since been determined by Captain Denham, in H.M.S. *Herald*, Captain F. P. Blackwood, in H.M.S. *Fly*, traced the outer edge of the Great Barrier reefs for 80 miles to the northward, with few irregularities, when detached reefs formed the north-eastern extreme of this portion of the barrier. The *Fly* anchored in 17 fathoms, coral rock and sand, on a small shelf running out from the south-west side of one of these reefs. This is a detached reef of an oval shape, differing much in feature from those hitherto observed along the outer edges of this part of the barrier, and is between 4 and 5 miles long, N.E. and S.W., 2 miles broad, and separated from the main body of the barrier by a channel 4 miles wide, in which no bottom could be found with 80 fathoms. The north-eastern extreme of the reef lies in lat. $21^{\circ} 5' S.$, long. $152^{\circ} 52' E.$ *

The *Fly's* average distance outside the Great Barrier reefs, when

* See Admiralty chart of Australia, east coast, Queensland, Keppel isles to Percy isles, No. 346 ; scale, $\frac{1}{4}$ = 0.25 of an inch.

skirting them, was between 2 and 3 miles, the soundings varying from 30 to 60 fathoms, sand or coral bottom. In lat. 22° S. she passed over some irregular ground, nearly 2 miles to the eastward of the reef, getting one cast of 12 fathoms.

The breakers were generally distinguished from the mast-head, at a distance of 7 or 8 miles, in clear weather; but as there were none seen to seaward from the two last-mentioned positions, and a very heavy swell was experienced, there can be little doubt of the outer edge of this part of the Barrier having been traced.

From the north-east elbow of Swain reefs, the outer edge of the Great Barrier reefs was traced by Captain Denham, W. by S. 20 miles, and from thence in a general W.N.W. direction 270 miles to Flinders passage. For the first 150 miles the cays and reefs along the barrier appear to have been mostly seen from a distance; but the remaining portion to Flinders passage was closely traced, the outer edge of the barrier there consisting of a chain of small detached reefs, with 30 to 40 fathoms close outside them; soundings having been obtained outside the barrier in 110 to 190 fathoms, between 5 and 10 miles from the reefs.

TIDES.—It is high water, full and change, at the south extreme of Swain reefs, at 8h. 30m. (approx.); springs rise about 7 feet. At 21 miles East of the south extreme of Swain reefs, Captain Denham found a regular tidal action, the flood setting West half a knot, and the ebb E. by S. three-quarters of a knot per hour; the flood stream ceasing one hour before high water on Swain reefs, and the ebb continuing one hour after low water on the reefs. But at 39 miles farther to the eastward, in lat. $22^{\circ} 31' S.$, long. $154^{\circ} 0' 13'' E.$, where the *Herald* anchored in the extraordinary depth of 220 fathoms, there was a steady S.W. current of half a knot.

Vine Horse-shoe shoal and David reef, the former reported to have been seen in about lat. $20^{\circ} 5' S.$, long $152^{\circ} E.$; and the latter in lat. $19^{\circ} 20' S.$, long. $151^{\circ} 5' E.$, and formerly supposed to be situated on the outer edge of the Great Barrier reefs, were carefully sought for by Captain Denham, but no shoals could be found in the positions assigned to them, and consequently they were expunged from the charts. [Information was afterwards received at the Admiralty that the ship *Wansfell*, Mr. Hugh Brodie, Master, bound to port Denison from England with emigrants, sighted two reefs, one in lat. $19^{\circ} 20' S.$, long. $152^{\circ} E.$; the other in lat. $20^{\circ} 5' S.$, long. $151^{\circ} 5' E.$, which latter is probably a portion of the edge of the Great Barrier reef. The former reef is described to be of an oval shape, N.W. and S.E., and about 5 or 6 miles in circumference, the latter to be about 10 miles in circumference, of a horse-shoe shape, and open to the N.N.E.] Vessels being in the vicinity of these reported dangers should exercise due caution.

FLINDERS PASSAGE, the northern entrance of which lies in lat. $18^{\circ} 52' S.$, long. $148^{\circ} 4' E.$, is about 20 miles long, North and South, and from 3 to 5 miles broad.*

From Flinders passage to the south side of Trinity opening, in lat. $16^{\circ} 35' S.$, long. $146^{\circ} 10' E.$, the outer edge of the Great Barrier reefs appears to be unknown, but it probably trends in a N.W. direction 170 miles.

This part of the barrier is so remote from the Outer route, that no vessel, under ordinary circumstances, need approach it when proceeding to the northward. But in beating to the southward from Torres strait, great care should be taken to keep well off it.

TRINITY OPENING, about 25 miles to the northward of cape Grafton, is 10 miles broad, but numerous coral patches lie in mid-channel.†

The outer edge of the Great Barrier from Trinity opening to lat. $16^{\circ} 8' S.$, or nearly abreast of cape Tribulation, consists of irregular detached reefs, and is then first known to assume a uniform and well-defined character, extending in a direct line nearly parallel with the coast, N. by W. 90 miles, to abreast of Lizard island. Between Trinity opening and lat. $15^{\circ} S.$, or nearly abreast of cape Flattery, the barrier is intersected by numerous narrow openings, through which a vessel, if hard pressed, might at great risk pass in safety; a narrow unbroken reef then extends northward nearly 18 miles, to abreast of Lizard island.‡

From the vicinity of Lizard island to lat. $12^{\circ} 25' S.$ there is a great sameness in the features of the barrier, its outer edge consisting of reefs which vary in shape between irregular ovals and long narrow strips, intersected by numerous openings; the greatest length of reef observed without an opening was nearly 21 miles. These reefs vary from 2 to 20 miles in length, and are generally from half a mile to one mile in breadth.

ONE-AND-A-HALF-MILE OPENING.—From the parallel of Lizard island the barrier takes a N.W. direction for 18 miles, to a channel $1\frac{1}{2}$ miles wide in lat. $14^{\circ} 26' S.$, long. $145^{\circ} 29' E.$ There are several intermediate openings; that through which Captain Cook passed bearing N.E. $\frac{1}{2}$ N. $9\frac{1}{2}$ miles from Lizard island peak.§

* See Admiralty chart of Australia, east coast, Whitsunday island to Magnetic island, No. 348; scale, $m = 0.26$ of an inch.

† See Admiralty chart of Australia, east coast, sheet xvi., No. 2,350; scale, $m = 0.25$ of an inch.

‡ See Admiralty chart of Australia, east coast, sheet xvii., No. 2,351; scale, $m = 0.25$ of an inch.

§ See Admiralty chart of Australia, east coast, sheet xviii., No. 2,352; scale, $m = 0.25$ of an inch.

The outer edge of the Great Barrier reefs from One-and-a-half-mile opening, trends nearly N.W. by W. $\frac{3}{4}$ W., 56 miles, to a projecting point of reef bearing N. by E. $\frac{1}{2}$ E. 15 miles from cape Melville. There are several passages through this part of the barrier, that most free from dangers being No. 1 Sand-bank opening in lat. $14^{\circ} 10' S.$, long. $144^{\circ} 53' 30'' E.$, and bearing E. $\frac{1}{2}$ N. 20 miles from cape Melville. Between this opening and the point of reef off cape Melville, the barrier appears to be impenetrable.

OPENINGS off CAPE MELVILLE.—From the projecting point of reef, 15 miles northward of cape Melville, the barrier trends 15 miles to the westward, and consists of four detached reefs, Nos. 2 and 3 having dry sand-banks on their western ends, with five clear deep channels, through either of which a vessel may in a few minutes pass safely from the Coral sea into the Inner route, should any mishap compel her to make the coast so far to the southward.* See page 309.

FIRST 3 MILE OPENING.—The Great Barrier reefs next trend N.W. $\frac{1}{2}$ N. 34 miles to First 3 mile opening, on the north-west side of which is a dry sand-bank (No. 7) in lat. $13^{\circ} 26' 30'' S.$, long. $144^{\circ} 1' E.$ There are several other openings through this part of the barrier, the safest of which may be distinguished by a sand-bank (No. 5) on its south-east side, in lat. $13^{\circ} 43' S.$, long. $144^{\circ} 14' 45'' E.$

SECOND 3 MILE OPENING.—From First 3 mile opening the Great Barrier reefs trend N. by W. 24 miles to a sharp spit forming the east side of Second 3 mile opening, in the centre of which is a small coral patch, in lat. $13^{\circ} 5' S.$, long. $143^{\circ} 55' E.$; this opening may also be known by a black rock above water, $1\frac{1}{2}$ miles to the south-westward of the spit.†

SOUTHERN SMALL DETACHED REEF.—The Great Barrier reefs from Second 3 mile opening, trend nearly N. by W. $\frac{1}{4}$ W. 40 miles, to lat. $12^{\circ} 25' S.$; its chief characteristics being the narrowness

* Captain Edwards of the Mercantile Marine, an experienced navigator in these waters, writing in 1868, strongly recommends that during the S.E. mousoon, a crank or leewardly vessel wishing to touch at cape York, should pass into the Inner route through the channels on either side of No. 3 sand-bank off cape Melville, in preference to the Raine island passage with its dangers; or the great N.E. channel, when she would find it difficult to fetch the cape. The advantages claimed for this route are, that the land is seen before making the reefs, thus enabling a ship to fix her position and enter at any time before dark; once inside there is smooth water and good anchorage, and the Inner route northward of the Flinders group has since the erection of beacons on the various reefs, and placing of light-vessels at the most dangerous parts of the channel, been divested of many of its terrors.

† See Admiralty chart of Australia, east coast, sheet xix., No. 2,353; scale, $m = 0.25$ of an inch.

of its reefs, and the Southern small detached reef, lying 3 miles outside, in lat. $12^{\circ} 35' 30''$ S., long. $143^{\circ} 51' 30''$ E.

There are several narrow openings through this part of the barrier which would not be worthy of notice but for the memorable circumstance of Bligh Boat entrance, in lat. $12^{\circ} 51'$, and Providential channel, in lat. $12^{\circ} 39'$ S., having afforded preservation to Captains Bligh and Cook, when in the most perilous situations outside the reefs.

From lat. $12^{\circ} 25'$ to $11^{\circ} 20'$ S. the outline of the Great Barrier reefs is very irregular, although the peculiar character of the individual reefs remains the same. The detached reefs outside the barrier spring up abruptly from a very deep bed.

It is remarkable that the channels formerly adopted, between latitudes $12^{\circ} 15'$ and $11^{\circ} 30'$ S., should pass through the most varied features of any portion of the Great Barrier reefs, which, as before observed, generally run parallel with the line of coast, forming long trends, scarcely deviating from a straight line. Here, on the contrary, they form several deep bights or bays, with long projecting points between, which are certainly very perplexing, and even dangerous to a stranger wanting in nerve, and unaccustomed to coral reefs.

The earlier adopted routes, in the immediate vicinity of Murray isles, were found tedious and highly dangerous, from the numerous and extensive coral reefs which lie both east and west of the line of barrier. But Bligh entrance, still farther to the northward, when its advantages become better known, will in all probability be preferred to either of the channels through the Great Barrier reefs to the southward.

NORTHERN SMALL DETACHED REEF, in lat. $12^{\circ} 24' 30''$ S., long. $143^{\circ} 50'$ E., is a small isolated reef, similar to that to the southward; it lies nearly 4 miles outside the barrier, but no soundings could be obtained near it.

QUOIN ENTRANCE is a deep clear passage through the barrier, nearly three-quarters of a mile broad, and 4 miles to the westward of Northern small detached reef, which is a good guide for making the channel, as the sea generally breaks heavily upon the reef. In clear weather Quoin island may be seen from aloft, bearing W. $\frac{3}{4}$ S. distant 14 miles.

BLACK ROCKS.—The Great Barrier reefs from Quoin entrance trend north-eastward 16 miles to a projecting spit, on which are two black rocks, in lat. $12^{\circ} 12' 30''$ S., long. $143^{\circ} 56'$ E.; these from being 8 or 9 feet above the level of the sea, form good marks for making Wreck bay from the southward. See page 312.

In the bight formed by the reefs between Quoin entrance and the south end of the reef on which the Black rocks are situated, the ship *Ferguson*

was wrecked in 1841, at about N. by W. 4 miles from Northern small detached reef; as she was thrown so high on the reef as to be clear of much of the heave of the sea, it is probable that some portion of the wreck may remain many years. There is a narrow but clear passage at about one mile to the north-eastward of the wreck, which a sailing vessel should run for, in the event of being set into the bight, through light winds or flood stream, as in such a case she should not attempt to work out again, but take advantage of the first available opening that presents itself.

WRECK BAY is a deep circular indentation of the Great Barrier reefs, extending 6 miles across from the Black rocks to the point of reef forming the northern side of the entrance; a vessel making these rocks from the southward, will have no reefs in sight to the northward; this formerly led to the opinion that the barrier was here skirted by numerous detached reefs.

Within the entrance, Wreck bay is 12 miles broad, North and South, and 9 miles in depth; the south side to the westward of the Black rocks is simply defined by the 100-fathoms line of soundings, within which the depth is irregular, varying from 4 to 21 fathoms, with numerous coral patches, upon most of which the sea breaks. There are a few under water, but as they are close inside the margin of what may be called no soundings, the change in the colour of the water over the patches generally shows their positions.

BLACK ROCKS ENTRANCE, the broad opening in the south-west part of Wreck bay, should be entered by closely rounding the Black rocks and then steering about S.W. by W.; smooth water and anchorage in from 16 to 20 fathoms, will then soon be found under the lee of the barrier.

SAFE ENTRANCE, W. $\frac{1}{4}$ N. 8 miles from the Black rocks, is three-quarters of a mile wide, with a cluster of coral patches to the southward of it. At about $1\frac{1}{4}$ miles to the northward of Safe entrance, the ship *Martha Ridgway* was wrecked in 1842, by drifting upon the reef during the night; some portion of this wreck may yet remain to serve as a beacon.

NIMROD PASSAGE, one of the most frequently used, is formed in the bight of Wreck bay, N.W. by W. 10 miles from the Black rocks; it is half a mile wide, with from 32 to 37 fathoms in mid-channel, and is separated from another half-mile opening, immediately to the southward of it, by a coral reef 3 miles in circumference, on which is a small sand-bank.

DIRECTIONS.—There are several small, but clear channels through the reef from Nimrod passage, round to the north point of the entrance of Wreck bay; as there is, however, generally a leading wind,

enabling a vessel to select either of the better passages through the southern or western part of the bay, they should be preferred. But it is recommended, in the event of a vessel having unintentionally entered Wreck bay, that she should run through either of the narrow passages which may appear practicable, in preference to hauling on a wind, and attempting to beat out of this deep bight against light winds or a flood stream, which might prove fatal, as in the case of the *Martha Ridgway*, from which circumstance the bay received its name.

SINGLE ROCK ENTRANCE.—From the extremity of the reef forming the north point of the entrance of Wreck bay, the outer edge of the Great Barrier reefs, off which is a confused sea, trends 4 miles to the northward, and then $3\frac{1}{2}$ miles north-westward to Single rock entrance, which is a safe channel one-third of a mile broad, and may be known by a solitary black rock on its south-east side. The barrier from this entrance trends N.W. $\frac{1}{2}$ W. 9 miles to Stead passage.

The trend of the Great Barrier on either side of Single Rock entrance being nearly parallel with the reefs forming the northern side of Wreck bay, a projection of the barrier is thus formed, extending 8 miles to the south-eastward, and 3 miles broad, the interior of which is a smooth and secure anchorage. See page 314.

YULE DETACHED REEF, in lat. $11^{\circ} 58' S.$, long. $143^{\circ} 59' E.$, is $6\frac{1}{2}$ miles in circumference, with very deep water round it; and as it lies N.N.E. $\frac{1}{2}$ E. 4 miles from Single Rock entrance, and E. by S. 9 miles from Stead passage, it may in some measure serve to show the positions of these channels.*

STEAD PASSAGE, in lat. $11^{\circ} 55' S.$, long. $143^{\circ} 50' E.$, is one-third of a mile broad, and similar in character to the narrow openings already described; it is, however, somewhat difficult to make, as it lies at the head of a deep bight of the barrier.

The Great Barrier reefs from $1\frac{1}{2}$ to 3 miles northward of Stead passage, are intersected by two or three narrow openings, through which a vessel might probably enter in the event of missing, or not being able to fetch Stead passage.

The barrier, which now becomes barely one-quarter of a mile wide, next trends 9 miles to the north-eastward, and is succeeded by the edge of the bank extending from the mainland, which is only defined by the 100-fathoms line of soundings, and the difference in the colour of the water.

There is a small opening in the barrier, $9\frac{1}{2}$ miles to the north-eastward of Stead passage, which may be known by some rocks above water, on

* See Admiralty chart of Australia, east coast, sheet xx., No. 2,354; scale, $m = \frac{1}{100000}$ of an inch.

its northern side; but as it has not been closely examined, a vessel finding herself so far to leeward of Stead passage, and having sufficient wind, is recommended to push on 2 or 3 miles farther to the northward, and there round the spit which terminates this part of the barrier. Vessels will find the most convenient anchorage in 13 or 14 fathoms, at about 3 miles within the barrier, the water there not being so deep, and the bottom less likely to foul the anchor than would be the case nearer the reefs.

The 100-fathoms edge of the bank of soundings extends about 16 miles north-eastward from the spit of the reef just mentioned, to a very projecting elbow of the barrier, in lat. $11^{\circ} 32'$ S., long. $144^{\circ} 5'$ E., this opening being the entrance of Blackwood channel described at page 318.

GREAT DETACHED REEF, which lies off the entrance of Blackwood channel, is of an irregular form, $12\frac{1}{2}$ miles long, S.E. by S. and N.W. by N., and $3\frac{1}{2}$ miles broad, except at its centre, where a broad elbow extends nearly 4 miles from the east side of the reef; its outer extreme lying in lat. $11^{\circ} 44' 30''$ S., long. $144^{\circ} 7'$ E.; from this point the south-eastern extreme of the reef bears S. $\frac{3}{4}$ W. $5\frac{1}{2}$ miles, and the northern end, N.W. by N. $8\frac{1}{2}$ miles. The eastern side of the reef consists of a continuous barrier, with numerous rocks visible at low water. Two narrow, but clear channels lie close together, at nearly mid-way between the eastern and northern extremes of the reef. See page 315.

RAINE ISLAND, which may be easily known by the substantial tower built on it, is situate in the centre of the opening between the northern extreme of the Great detached reef, and the projecting point of the Great Barrier reefs N.E. by N. $8\frac{1}{2}$ miles from it; there is a clear channel on either side of the island, the southern being $3\frac{1}{2}$ miles, and the northern, nearly 2 miles wide. The island, which is of coral formation, is nearly three-quarters of a mile in circumference, and 20 feet above the low-water level; it is surrounded by a coral reef, closely fringing the north-west end, but extending $1\frac{1}{4}$ miles from the south-east extreme of the island; this reef is in most parts dry at low water, and entirely so at springs.

As no bottom could be reached with 125 fathoms of line, in any part of the opening, nor close up to the lee of the Raine island, it affords no anchorage.

Beacon. — Raine island having been for many years the most important point for entering Torres strait from the Outer route, it was considered by Captain F. P. Blackwood the most eligible site for a sea mark; a substantial beacon of stone was accordingly erected, in 1844, under his direction, on the south-east point of the island. The beacon, a view of which is given at page 316, is a circular tower, and was surmounted by a wooden dome with a ball on the top; the whole having been 64 feet

high, or 74 feet above low-water mark, and 30 feet in diameter at the base. It was painted with alternate red and black vertical stripes, and in clear weather, was visible 8 or 9 miles from the deck. Its position is in lat. $11^{\circ} 35' 50''$ S., long. $144^{\circ} 2' 20''$ E.*

In 1860, the dome had decayed and fallen in; but the tower still remained a substantial building, 60 feet high, and should be visible 8 miles in clear weather.

Supplies.—An ample supply of provisions used formerly from time to time to be lodged in the chambers of the beacon, for the relief of shipwrecked or other distressed persons; and an iron tank, capable of holding 5 tons, was placed at its base for the reception of rain water from the roof. But the tank is now completely worn out, and no provisions are to be obtained here, the proximity of the settlement of Somerset in port Albany, and of the light-vessel at Piper islands, removing the necessity of keeping up these supplies.

TIDES.—It is high water, full and change, at Raine island, at 8h. 10m. by the shore, and an hour and three-quarters later in the stream; springs rise 10 feet. The strength of the stream sometimes exceeds 2 knots, the flood coming from the eastward; there is also generally a current setting one knot to the northward, along the face of the Barrier, and to the north-west through Raine island entrance, during the prevailing S.E. winds. The neap tides are, at times, scarcely perceptible, and there are many irregularities with respect to the stream and its velocity, which must for the present remain unaccounted for; but for all the purposes of navigation, 9h. 30m. or 10h. may be considered the time at which the flood ceases, and it becomes slack water at full and change; the flood stream running on an average 7 hours to the westward, and the ebb 5 hours to the eastward.

PANDORA ENTRANCE.—From the projection 5 miles N.N.E. $\frac{1}{4}$ E. of Raine island, the Great Barrier reefs trend north-westward nearly 7 miles to a vegetated sand-bank 6 to 7 feet above high water, in $11^{\circ} 26' 30''$ S., long. $144^{\circ} 1' 30''$ E., on the south-east side of the entrance, through which H.M.S. *Pandora* passed in 1791. Pandora entrance is $2\frac{1}{4}$ miles broad, N.W. and S.E., and has depths of 20 fathoms to 40 fathoms in it. Several detached reefs lie across the opening at about 2 miles within the entrance, but there is a clear passage between them, one mile wide, with the sand-bank bearing N.E.

Although this entrance is not a channel to be selected in preference to others, its leeward position renders it a very valuable opening for a vessel to run for, which from error in her reckoning, or from strength of

* See sketch on Raine island on Admiralty chart of Australia, east coast, sheet xx., No. 2,354.

current finds herself too far to leeward to enter by Raine island, or the other passages to the southward. Directions for Pandora entrance have been given at page 321.

From Pandora entrance the barrier, consisting of a series of detached reefs, takes a N.E. by N. direction for 11 miles, when it suddenly projects $1\frac{1}{2}$ miles to the eastward, forming the south side of Olinda entrance, in lat. $11^{\circ} 15' S.$, long. $144^{\circ} 6' 30'' E.$

OLINDA ENTRANCE, $1\frac{1}{2}$ miles broad, is the most northern opening in the Barrier reefs near Raine island passage; it is well marked by the continuous reef north of it, but this entrance cannot be recommended unless ships are very far to leeward. Several shoals within the entrance, render it dangerous to navigate, more particularly as it has not been sounded.

At about midway between Pandora and Olinda entrances is an opening about three-quarters of a mile broad, through which the *Oriental* is supposed to have entered in 1840; but this passage is not recommended, in consequence of numerous scattered reefs, upon which the sea generally breaks very heavily.

From Olinda entrance, the outer edge of the Great Barrier reefs extends nearly N.N.W. 35 miles, to lat. $10^{\circ} 40' S.$, or about the parallel of cape York, the reefs varying from half a mile to $4\frac{1}{2}$ miles in breadth. This portion of the reefs may be said to form an impenetrable barrier, as apparently it is not intersected by any passage, fit even for the smallest vessel to take. The water appears to be free from dangers close within the inner edges of the reefs.

YULE ENTRANCE.—The Great Barrier reefs, from lat. $10^{\circ} 40' S.$, take a northerly direction for 17 miles to Yule entrance in lat. $10^{\circ} 23' S.$, long. $143^{\circ} 56' 30'' E.$ This opening is about one mile broad, with a patch of coral, on which the sea breaks, nearly in mid-channel, leaving a passage nearly one-third of a mile wide, on its south side; but it is not to be recommended, except in cases of necessity, especially during springs, when the streams run with such velocity as would render a sailing vessel unmanageable in light breezes, the flood having been known to set through the opening at the rate of 5 knots per hour.*

From Yule entrance the Great Barrier reefs trend nearly N.N.E. 43 miles, when they are succeeded by a narrow shoal, extending $3\frac{1}{2}$ miles to the northward. On this shoal are from 2 to 4 fathoms water, with several dangerous sunken patches and strong tide rippings close off its north end, in lat. $9^{\circ} 41' S.$, long. $144^{\circ} 14' 30'' E.$

* See Admiralty chart of Australia, Torres strait, sheet 2, No. 2,422; scale, $m = 0.25$ of an inch.

This portion of the barrier differs in character from any other part to the southward, as it here consists of innumerable small patches, on which the sea breaks heavily; and although there is deep water between them, they still lie so close together, as to present from seaward the appearance of a continuous reef; but in reality there are many gaps through which a vessel might pass, although none of them can be recommended; as all the openings between Pandora entrance and the northern spit of the barrier must be considered dangerous, and neither of them should be attempted except in such cases of extremity, as when the first opening that presents itself should be taken advantage of, in preference to the risk of being driven upon the reefs by the rolling swell and rapid flood stream which a sailing vessel would find it next to impossible to beat off against, in the event of being set too near the barrier.

MURRAY ISLANDS.—(Maër), the largest of these three islands, and 750 feet high, is the first land in the north-eastern part of Torres strait visible from the eastward; and as it lies only 4 miles within the barrier, it is a good mark for making the reefs. *See* page 363.

FLINDERS ENTRANCE is an opening between the northern spit of the Great Barrier reefs above mentioned, and a cluster of reefs on one of which is a sand-bank in lat. $9^{\circ} 35'$ S., long. $144^{\circ} 11'$ E. extending S.E. by S. nearly 4 miles from the northern extreme of a sort of inner barrier, which extends 18 miles from the sand-bank in the direction of Murray island; this forms the western side of Flinders entrance, which is 18 miles long, and about 4 miles wide. Several coral patches lie nearly in the middle of the channel, and the soundings are deep and irregular; and as it does not lead to any direct route through Torres strait, it can only be recommended as affording the most direct approach to Murray islands, and temporary anchorage for a vessel making the barrier too late in the day to proceed farther before dark. In entering Flinders channel, care must be taken when rounding the spit of foul ground on the southern side of the entrance, across which the flood stream sets to the westward and the ebb to the eastward. *See* page 365.

EAST CAY is a dry sand-bank lying about 11 miles to the northward of that just described, on the northern side of Flinders entrance. It is situated on the north-west end of a cluster of reefs $3\frac{1}{2}$ miles long and $1\frac{1}{2}$ miles broad. There is a clear channel, 7 miles wide, between these reefs and the north extreme of the inner barrier, immediately to the northward of Flinders entrance.

ANCHOR CAY, the northernmost termination of the Great Barrier reefs, in lat. $9^{\circ} 22'$ S., long. $144^{\circ} 6'$ E., and W. by N. $\frac{1}{4}$ N. 6 miles from East cay, is a bare sand-bank about 12 feet high, on the north-west

end of a reef about 5 miles in circumference. It has not been closely sounded on the western side, but the water appeared deep all round it. There is a deep channel, about 4 miles wide, between this and East cay.

BLIGH ENTRANCE, the best approach to the Papuan or Great North-east channel, from the Outer route, is a clear space 18 miles wide, between Anchor and Bramble cays, with soundings in 13 to 40 fathoms, coral sand, and in some parts mud. Bramble cay lies in lat. $9^{\circ} 7' 50''$ S., long. $143^{\circ} 52' 10''$ E., and nearly N.W. $\frac{1}{2}$ W. 19 miles from Anchor cay.

REMARKS.—The Great Barrier reefs, from the parallel of cape Tribulation to their northern extremity, appear to be free from any outlying shoals skirting them, as far as could be seen from a vessel's mast-head, to the eastward with the exception of the Southern and Northern Small detached reefs, Yule detached reef, the Great detached reef, and Raine island. Exclusive of these, the nearest detached dangers outside the barrier to the northward, are the imperfectly known reefs, extending to the southward and westward of Portlock reefs, between the parallels of $9^{\circ} 28'$ and $10^{\circ} 30'$ S., which lie about 20 to 30 miles off.

The track of Captain Cook from Lizard island to Providential channel, the numerous routes of merchant shipping seeking an eligible opening, and the traverses of H.M.S. *Pandora*, prior to her disaster, while searching for an opening between Murray islands and lat. $11^{\circ} 24'$ S., are also confirmatory of the Great Barrier reefs presenting in this space a well-defined and clear margin, except where openings occur, and these are numerous, varying from half a mile to 3 miles in width. There are many smaller passages, which in cases of necessity, may be taken by a vessel with safety.

TIDES.—The time of high water, full and change, does not appear to differ more than $1\frac{1}{2}$ hours throughout the whole length of the Great Barrier reefs, the average time of high water being at about 9h. 15m., and the rise of tide from 6 to 12 feet.

At Swain reefs (the south-east extreme of the Great Barrier) the general direction of the flood through the reefs was found to be S.W., and the ebb to the north-eastward; the velocity between springs and neaps being from $1\frac{1}{2}$ to 2 knots; but the stream appeared to run with greater strength through the more confined channels.

Between Swain reefs and Lizard island the outer edge of the Great Barrier reefs is least known; but the flood appeared to run in, and the ebb out, through the openings of the reefs with a strength depending in great measure upon the breadth of the passage.

From Lizard island to lat. $12^{\circ} 30'$ or 13° S., the strength of the stream being confined to the openings, the velocity is increased or diminished according to the width of the channel; but even at a distance of a mile

or two from the reefs, the set is scarcely perceptible except at springs, when it does not exceed a knot, the flood setting to the N.W. and the ebb to the south-eastward.

From lat. $12^{\circ} 30'$ S. to Pandora entrance in lat. $11^{\circ} 26'$ S. the velocity of the stream at springs increases to $2\frac{1}{2}$ and 3 knots, with a regular ebb and flow, except that the strength of the flood appeared to continue half an hour longer than that of the ebb.

At Raine island it is high water at 8h. 10m., the rise being 10 feet at springs; and it is in this vicinity that the strength of the stream increases materially. The flood rushes in through the smaller channels with increased velocity; and it has been ascertained from good authority, that a well-found merchant vessel under full sail with a fair wind, has been barely able to effect an entrance against the strength of the ebb near Stead passage (in lat. $11^{\circ} 55'$ S.). The neap tides are comparatively very weak; a reference to the phases of the moon therefore becomes a question of importance when navigating near this part of the Great Barrier reefs.

From Pandora entrance (in lat. $11^{\circ} 26'$ S.) to the north-west extremity of the Great Barrier reefs, the sea being more confined between the coasts of Australia and New Guinea, the streams run with still greater velocity than farther to the southward, the flood having been known to run 5 knots through Yule entrance (in lat. $10^{\circ} 23'$ S.). Such a stream alone should deter any vessel from attempting to effect an entrance through any of the narrow gaps in this part of the barrier; but it must be observed, that the strength of the stream diminishes very considerably, as the distance from the reefs is increased.

At about 30 miles to seaward of the Great Barrier reefs, particularly to the northward of Raine island, it would appear from the continued strong set to the northward, during the south-east trade, that at least on the surface *nothing* must enter into the allowance to be made either for the ebb or flood; indeed, if not aware of the existence of such streams on the reefs, one would be led to suppose that only a north-westerly current existed. As far as a careful reckoning showed, whilst H.M.S. *Fly* was working during several long nights at sea, about 30 miles to windward of the barrier, no set was observed directly towards or off it; but there was a set to the N.W. and N.N.W.

OUTLYING DANGERS in the CORAL SEA.—The whole extent of the Great Barrier reefs, with the openings recommended having been described, the outlying islets and reefs will now be noticed, commencing from the south-eastward.*

* See Admiralty charts: Coral sea, sheets 1 and 2, Great Barrier reefs, Outer route, and Torres strait, Nos. 2,763 and 2,764; scale, $m = 0\cdot2$ of an inch; also Admiralty plans of islets and reefs in the Coral sea, No. 349; scale, $m = 1$ inch.

CATO ISLAND, discovered in 1803, is in lat. $28^{\circ} 15' S.$, long. $155^{\circ} 34' E.$ It is one-third of a mile long, E.N.E. and W.S.W., 300 yards broad, and its vegetated surface is 19 feet above high water.

The surface of Cato island consists of withered guano mixed with coral grit, covered with coarse tufted grass and creeping plants, which in parts are from 3 to 4 feet high, affording cover to numerous birds. Captain Denham planted a grove of fir trees on the islet, and sowed a variety of vegetable and other seeds. Wells were sunk on the islet, but no fresh water could be found.

Captain Denham, of H.M.S. *Herald*, in 1854, erected on Cato island a cone-shaped beacon 12 feet high, and 16 feet broad at the base, which in clear weather may be seen at from 10 to 12 miles distance. The cloud of birds which occasionally hangs over the island, will sometimes also show its position, when dipped behind the horizon.*

Cato reef.—Cato island is situated on, and near the western end of an oval-shaped lagoon reef, $1\frac{1}{2}$ miles long E.N.E. and W.S.W., and one mile broad at its eastern end. The sheet of water enclosed by this reef, which is always smooth when the reef is uncovered, has, where sounded, a depth of 3 to 12 feet, the only access to the lagoon and the islet being by three boat entrances through the northern edge of the reef, bearing respectively N.W. one-quarter of a mile, N.N.E. one-third of a mile, and N.E. two-thirds of a mile from the islet.

Cato bank rises abruptly from a depth of 200 to 50 fathoms, and extends about N.E. by E. 6 miles, N.N.W. 6 miles, and W.S.W. $5\frac{1}{4}$ miles from the islet, forming nearly the northern half of a circle; the southern edge of the bank extending from E. by N. to W. by S., and passing one-third of a mile from the south side of Cato reef.

The soundings on Cato bank from the northward, decrease, over a bottom of coral grit, towards two ledges of white coral grit and black coral blocks, which are distinctly reflected to the surface. One of these ledges, which have 10 to 20 fathoms water on them, extends in a N.E. by E. direction 5 miles, and the other W. by S. $4\frac{1}{4}$ miles from Cato islet: the north-eastern ledge is about $3\frac{1}{4}$ miles broad at its eastern end, and the latter from $1\frac{1}{4}$ to three-quarters of a mile across.

Hutchison Rock, on which there is only 18 feet water, lies E. by N. $3\frac{1}{4}$ miles from Cato island, and is the shoalest part of Danger patch, a 5 to 9 fathoms shoal, extending S.W. two-thirds of a mile, and North $1\frac{1}{4}$ miles from the rock, and situated on the eastern edge of the north-eastern ledge.

* Cato bank was described by Captain Flinders (who was in the *Porpoise* at the time of its discovery) as a small dry sand-bank, apparently destitute of vegetation.

The western ledge has a ridge with 10 to 13 fathoms on it, extending W. by S. 4 miles from Cato island, and is about half a mile broad.

There are 10 fathoms water round Cato reef, at the distance of one-quarter of a mile, and the hand lead will give warning when approaching the reef from any direction, except from the eastward, where it is fronted by Danger patch, and from the southward, where there is a depth of 150 fathoms at one-third of a mile from the reef.

Anchorage.—Captain Denham found the easiest anchorage, as regards the sea and current, as well as communication with Cato islet, in 16 fathoms, coral grit, with the east end of the islet bearing South, distant two-thirds of a mile. Vessels may get temporary anchorage on the western ridge, when a light anchor should be used, as it will be sure to hook on to coral rock. The eastern, and generally windward ledge should be avoided both on account of the tide race on it and of Hutchison rock.

TIDES.—It is high water, full and change, at Cato island, at 8h.; springs rise 6 feet. The streams run from one to $3\frac{1}{2}$ knots during southeasterly winds; but the direction appears to depend much upon the wind and scend of the sea. The weather tide stream, however, shows itself by the ripple, and may be taken advantage of in closing the reef, or in getting under way, when to windward of it.

WRECK REEF, on the central part of which the ships *Porpoise* and *Cato* were wrecked in 1803, consists of a chain of reefs extending $18\frac{1}{2}$ miles E. by N. and W. by S., and includes five sand-cays, none of which, except Bird islet, the easternmost cay, as yet produce vegetation, nor exceed an elevation of 6 feet above high water. The four bare sand-cays, neither of which is more than 130 yards in extent, lie at equal distances of 4 miles apart, each being surrounded by a reef of one to $1\frac{1}{2}$ miles diameter.

The passages between these reefs are about 2 miles wide, that between Bird islet and some patches to the south-westward of it, has a depth of 10 to 18 fathoms. The passage between the central cay and that next to the eastward of it has 9 fathoms; and as the sea breaks upon the reefs, and the bottom can be traced from the mast-head, a vessel caught upon the weather side of these openings, may push through either of the principal spaces, without any other care than to keep in mid-channel.

There are no soundings with 100 fathoms at half a mile from the southern, and generally weather side of the reefs; but there is anchorage in 10 to 20 fathoms on the northern side of most of the reefs.

Bird Islet, at the east end of Wreck reef, and in lat. $22^{\circ} 10' 30''$ S., long. $155^{\circ} 29' 21''$ E., is oval-shaped, half a mile round, and is elevated, 12 feet above high water. The southern side is formed of coral sand-

stone. The surface of the islet is flat and bare in the centre, surrounded by tufts of rank wiry grass and creeping plants, which thrive by the guano deposited by the vast number of birds which resort to the islet. The soil may, however, prove sufficiently fertile to produce vegetables from the various seeds sown on the islet by Captain Denham.*

Bird islet is situated on the western part of a shallow lagoon reef, $1\frac{1}{2}$ miles long E. by S. and W. by N., and about three-quarters of a mile broad near the islet; the only boat passage to the islet being through the western end of the reef.

There are no soundings with 100 fathoms, at half a mile from the north, east, and south parts of the reef. But between N.W. and S.W. there is a bank of soundings with from 5 to 26 fathoms, coral sand and rock, extending $1\frac{1}{2}$ miles from the reef, between these bearings, and also apparently in a W.S.W. direction, to the patches of breakers and the next islet to the westward, lying respectively $2\frac{1}{2}$ and $4\frac{1}{2}$ miles from Bird islet.

The anchorage is in from 10 to 16 fathoms water at about one third to half a mile W.N.W. from the west extreme of Bird islet reef.

West Islet, at the west end of Wrock reef, and in lat. $22^{\circ} 12' 4''$ S., long. $155^{\circ} 11' 51''$ E., is a small bare sand-cay, 6 feet above high water, and situated on the north-western part of a reef nearly one mile long, N.W. and S.E., and half a mile broad. A ledge of sunken rocks extends from one half to $1\frac{1}{2}$ miles south-eastward of West islet reef, there are from 4 to 6 fathoms between the rocks and the reef.

A reef about 2 miles in extent lies to the north-westward, and a smaller one to the northward of West islet; the three reefs being separated from each other by channels about one-quarter of a mile wide.

Anchorage.—The channels between this triangle of reefs form a reef-sheltered haven, with 4 to 7 fathoms water, and clear entrances from the S.W. and North, but the south-eastern channel has a 3-fathoms ledge across its entrance, with a spit projecting to the eastward.

TIDES.—It is high water, full and change, at Bird islet, at 8h. 3m.; springs rise 6 feet; the flood sets to the S.W. and the ebb to the N.E. one knot.

KENN REEF consists of four separate reefs, which form a curved chain extending N.E. by E. $\frac{1}{2}$ E. $6\frac{1}{2}$ miles from its south-western extreme to its Eastern projection, and from thence nearly N.N.W. $\frac{1}{2}$ W. 10 miles to

* In November 1868 H.M.S. *Virago* visited the islet and found two men with their wives and families living there; they had sheds erected and were engaged preparing guano for shipment, a considerable quantity being annually exported. The greater part of the islet down to the rock is apparently composed of that material. Turtle were plentiful, but water scarce, the establishment depending entirely on the rain for their supply.

its North-western extreme; the western side of these reefs thus forming a bay, on a bank of soundings in 5 to 37 fathoms, coral sand and rock, extending north-westward 8 miles from the bight, outside of which the depth suddenly increases to no bottom in 250 fathoms.

The South-easternmost and largest reef, which dries at half tide, and on which the sea always breaks, is of a triangular shape, extending from its Eastern projection—on which is a high reef stone—S.W. by W. 4 miles, and N.W. $2\frac{1}{2}$ miles. The south-east and north-east sides of this reef are slightly embayed, and the former was found by Captain Denham, in 1859, so strewn with wrecks, as would suggest a lighthouse being erected on the reef, if it were fit to sustain such a structure and party. The western side is broken and irregular, with a 5 to 7 fathoms inlet trending half a mile eastward and three-quarters of a mile northward into the shallow lagoon enclosed by the reef.

There are three slightly vegetated sand-cays on the south-easternmost Kenn reef, nearly in line N.E. by E. and S.W. by W., and $1\frac{1}{2}$ miles apart from each other. The central and largest of these cays, which does not exceed 150 yards in length, nor $6\frac{1}{2}$ feet above high-water springs, lies in lat. $21^{\circ} 15' 44''$ S., long. $155^{\circ} 49' 25''$ E. Captain Denham built a beacon on this cay from pieces of wreck found on it; and also sowed some garden seeds.*

The next reef North of the south-easternmost Kenn reef is 2 miles long N.N.W. and S.S.E., and three-quarters of a mile broad. This reef dries at half tide, and encloses a shallow lagoon, with an opening on the west side of the reef. Between this and the South-easternmost reef is an opening half a mile wide, but it is unsafe for boats.

The South-western extreme is a reef, dry at half tide, with a sand-cay on it; and is separated from the south-west point of the main Kenn reef, just described, by an opening $1\frac{1}{2}$ miles wide, with 4 to 12 fathoms water; but the centre of this opening is unsafe for ships, on account of a patch of foul ground with 4 to 5 fathoms, lying in it.

North-western extreme.—The northernmost Kenn reef, which dries at half tide, is $2\frac{1}{2}$ miles long N.N.W. and S.S.E., and three-quarters of a mile broad, with a lagoon, opening on the west side of the south point of the reef. A small cay lies half a mile North of the opening, and there are some high reef-stones on the north end of the reef. The North-western extreme of the reef, from which sunken rocks extend a quarter of a mile, lies in lat. $21^{\circ} 6' 8''$ S., long. $155^{\circ} 47'$ E. There is a safe channel, $2\frac{1}{2}$ miles wide, with from 10 to 33 fathoms, between this and the next reef to the southward.

* The beacon was in existence in 1876, when the reef was visited by the German Frigate *Gazelle*.

Soundings.—There are from 125 to 190 fathoms, coral grit, at from half to one mile southward and eastward of the south-easternmost Kenn reef; but on the western side, there are from 10 to 30 fathoms, coral sand and rock, extending about 8 miles to the westward; within the reefs numerous sunken patches rise abruptly from deep water to near the surface, but all are easily seen.

Anchorage is to be found to the westward of Kenn reefs; the smoothest and best being where the *Herald* anchored, in 13 fathoms, coral sand, about two-thirds of a mile from the south-easternmost reef, with the central cay bearing E. by S.; but care must be taken to avoid the sunken patches before noticed.

TIDES.—It is high water, full and change, at Kenn reef, at 8h.; springs rise $5\frac{1}{2}$ feet. A current of half a knot per hour ran W.S.W. through the passage between the North-west reef and the reef next south of it.

FREDERICK REEF consists of two reefs and a rock awash, extending together N. by E. $\frac{1}{2}$ E. and S. by W. $\frac{1}{2}$ W. $6\frac{1}{2}$ miles, and 3 miles across; the southern portion encloses Anchorage sound, a spacious and secure roadstead, with 10 to 13 fathoms, coral sand and rock.

The southern and principal reef, is of a crescent form, with Observatory cay, a bank of bright shingly coral, 4 feet above high-water; but, as it lies within one quarter of a mile of the south extreme of the reef, the surf sometimes runs over it, in heavy gales. From Observatory cay, which lies in lat. $21^{\circ} 1' 46''$ S., long $154^{\circ} 25' 7''$ E., the outer edge of this reef sweeps round north-east and northward to the north point; and westward to a remarkable reef-stone, a solitary leaning rock, 4 feet above high water. This reef is half a mile broad near Observatory cay, and gradually narrows towards the extreme points. The inner edge of the reef, which is always covered, and has some sunken coral patches lying half a mile off it, is intersected by a boat channel leading to the cay from the northward.

The northern of the Frederick reefs, the north extreme of which lies N. $\frac{1}{2}$ E. 6 miles from Observatory cay, is $1\frac{1}{2}$ miles long North and South, and half a mile broad, with a small cay on it, at half a mile from the south extreme of the reef.

From the remarkable reef-stone Danger ridge, which is very narrow, extends nearly N. by W. $2\frac{1}{4}$ miles to Ridge rock, a small patch on which the sea always breaks. Although there are 5 to 7 fathoms water on the ridge, at three-quarters of a mile to the northward of the remarkable reef-stone, and 5 and 6 fathoms at half a mile South of Ridge rock, this apparent passage should not be attempted by a ship, there being some 9-feet patches on the ridge.

Anchorage Sound is nearly $2\frac{1}{4}$ miles wide between the north point of the southern Frederick reef and Ridge rock, and $2\frac{1}{2}$ miles

deep, with regular soundings in 10 to 17 fathoms; coral sand, affording excellent anchorage, sheltered from the sea eastward, between N.N.E. and S.S.W., without any sunken danger up to within half a mile of the bight near Observation cay.

There is a safe ship passage $1\frac{1}{2}$ miles wide, between the northern and main Frederick reefs, with 6 to 9 fathoms; but two rocky 5-fathoms patches lie in this passage, one at one-quarter of a mile, and the other three-quarters of a mile from the north point of the southern reef.

Captain Denham found no vegetation on any part of Frederick reefs, except a few small creeping plants on Observatory cay, where he sowed some cucumber and melon seeds, and erected a small temporary beacon, 20 feet high, from some wreck timber found on the cay.

Soundings.—To the northward of Anchorage sound there is a bank of soundings from 10 to 33 fathoms, extending nearly 2 miles north-westward from the northern reef, and $3\frac{1}{2}$ miles westward from the eastern line of the reefs; there is also a shelf of 10 to 70 fathoms, half a mile wide, on the west side of Danger ridge. Outside these limits and to the southward and eastward of Kenn reefs there is no bottom at 100 fathoms.

TIDES.—It is high water, full and change, at Observatory cay, at 8h.; springs rise 6 feet. A current ran westward through the ship-passage, between the northern and southern reefs, at the rate of $1\frac{1}{2}$ knots per hour.

SAUMAREZ REEFS.—The eastern and windward of these reefs forms a barrier awash at half tide, with reef-stones on it always above water, extending from the south-east elbow N.N.E. $\frac{1}{2}$ E. 20 miles, and is from three-quarters to one-quarter of a mile broad. This barrier is intersected by four openings, distant respectively $1\frac{1}{2}$, 3, 6, and $9\frac{1}{2}$ miles from the north extreme of these reefs.

None of these openings, except the northernmost—in which there are 8 to 14 fathoms—have been sounded, and as they all have overfalls on the ebb, across them, they are not noticed by Captain Denham as navigable channels, and which they appear not to be, as a shoal half a mile to 2 miles broad, with sunken patches on it, forms the inner or western side of the barrier, extending, without any apparent opening, 12 miles, and probably farther northward from the S.E. elbow.

Three reefs, the central and smallest of which is not more than half a mile in extent, lie between three-quarters of a mile and $4\frac{1}{4}$ miles to the westward of S.E. elbow, from which and from each other, they are separated by openings three-quarters of a mile to one mile wide. These openings have not been sounded, and they are represented as having overfalls across them.

S.W. Cay, N.W. by W. $\frac{1}{2}$ W. 6 miles from S.E. elbow, and in lat. $21^{\circ} 50' 48''$ S., long. $153^{\circ} 31'$ E., is the westernmost part above water of Saumarez reefs: it is about 200 yards in extent, 8 feet above high water, and is surrounded by a reef, half a mile in diameter. There are 17 to 23 fathoms water at half a mile northward and westward of the reef; and a ship channel $2\frac{1}{2}$ miles wide, with 15 to 24 fathoms between S.W. cay and the reefs to the south-eastward of it.

A small patch, on which the sea always breaks, lies North $6\frac{1}{2}$ miles from S.W. cay: there are 9 to 18 fathoms water at half a mile North and South of this patch, and there is a passage, with 14 to 26 fathoms, between it and S.W. cay.

There are regular soundings in 20 to 24 fathoms, coral sand, between the southern half of Saumarez barrier reefs and S.W. cay, where a vessel might find anchorage, sheltered from the eastward.

N.E. Cay, the north-easternmost extreme of Saumarez reefs, lies N.W. $1\frac{1}{2}$ miles from the north extreme of the barrier reefs, and in lat. $21^{\circ} 38' 11''$ S., long. $153^{\circ} 47' 21''$ E. It is 8 feet above high water and is surrounded by a coral belt half a mile in diameter, with 7 to 12 fathoms close round it. There is a clear channel $1\frac{1}{2}$ miles wide, between N.E. cay and the north extreme of Saumarez barrier reefs.

Soundings.—Captain Denham found the weather, or eastern edge of Saumarez reefs unlike others he had visited in the Coral sea, not only from there being soundings in less than 100 fathoms at $1\frac{1}{2}$ miles off, but also from their being detached rocks at a quarter of a mile outside the weather edge of these reefs.

The bank of soundings partly enclosed by Saumarez reefs, extends from their south extreme to 4 miles westward of S.W. cay; and from thence the 100-fathoms edge of the bank appears to sweep round northward and north-eastward to about one mile North of N.E. cay.

There is a channel 35 miles wide, between Saumarez reef and the Great Barrier reefs, which may be taken advantage of, on a vessel being set so far to leeward, when proceeding northward or southward through the Coral sea, or, when working to the southward, to avoid the greatest force of the south-east wind, which prevails in the eastern part of the Outer route.

TIDES.—It is high water at N.E. cay, full and change, at 8h.; springs rise 6 feet. The flood was found to set S.W. one knot from low water to half flood; and the ebb N.E. $1\frac{1}{2}$ knots from half flood to low water. The ebb stream showed itself by tide ripples across the openings, as the *Herald* traced the outer margin of the reefs.

THE EASTERN REEFS.—The reefs forming the western side of the southern part of the Outer route having been described, the

navigator's attention will be next directed to the extensive chain of reefs which bound the route to the eastward, from lat. $21^{\circ} 55'$ S., long. $159^{\circ} 25'$ E., to the North elbow of Bampton reef, in lat. 19° S., long. $158^{\circ} 27'$ E.

SOUTH BELLONA REEFS are two in number, awash at half tide, with a detached sand-cay at N. by W. $1\frac{3}{4}$ miles from the north extreme of the eastern reef. The west point of the western reef lies in lat. $21^{\circ} 52' 22''$ S., long. $159^{\circ} 26' 10''$ E., from whence it extends E. $\frac{1}{4}$ N. $4\frac{1}{2}$ miles, and is from one mile to half a mile broad. The west extreme of this reef shelves off for one-quarter of a mile, in narrow prongs, with 9 fathoms about them at half a mile off. Numerous sunken patches lie from one-quarter of a mile to two-thirds of a mile off the eastern part of the north-edge of the reef.

The eastern reef of the South Bellona group, which is separated from the western reef by a 7-fathoms channel half a mile wide, is 5 miles long N.E. and S.W., and from one to $1\frac{1}{2}$ miles broad. It encloses a lagoon with 4 fathoms water between the coral patches in it, but it appears to have no entrance through the reef. The northern extreme of this reef is rendered conspicuous by Nigger Head rock; a black and unusually large block of coral 6 feet square, and 2 feet above high water.

The Sand Cay, N. by W. $\frac{1}{4}$ W. $1\frac{1}{4}$ miles from Nigger Head rock, and in lat. $21^{\circ} 47' 20''$ S., long. $159^{\circ} 35' 1''$ E., always shows brightly, and, being 5 feet above high-water level, it may afford temporary refuge to the crew of a vessel wrecked on the adjacent reefs, where there is no footing at high water. This cay is surrounded by a fringe reef, half a mile in diameter, with a spit projecting one-quarter of a mile to the south-eastward, and there is a boat passage through the western side of the reef.

The space between this Sand cay and Nigger Head rock forms a 13-fathoms channel, nearly $1\frac{1}{2}$ miles wide, which would be convenient for a vessel making South Bellona reefs from the south-eastward with a southerly wind, and intending to anchor under their lee.

There was no bottom in 200 fathoms, at half a mile off the southern edge; but there are regular soundings in 20 to 28 fathoms, coral sand, along the northern side of these reefs, affording anchorage sheltered from south and south-east winds, where a look-out may be kept for whales, a great number of which were seen by Captain Denham, in September 1858. A 13-fathoms patch of foul ground, with overfalls, lies $3\frac{1}{2}$ miles to the north-westward of the west extreme of the western reef.

Tides.—It is high water, full and change, at the South Bellona reefs, at 8h. 24m.; springs rise 5 feet.

MIDDLE BELLONA REEFS are two in number, lying E. $\frac{1}{2}$ S. and W. $\frac{1}{2}$ N. from each other, with a navigable opening between them. The western reef, which uncovers at half tide, and encloses a small lagoon, is $1\frac{1}{2}$ miles long N.E. and S.W., and one mile broad at the centre. A small bay indents the north side ; and two points, with sunken patches close off them, form the western extreme of this reef.

Observatory cay, which is situated on the northern of the two reef points just noticed, and in lat. $21^{\circ} 24' 18''$ S., long. $158^{\circ} 52' 51''$ E., is a bright coral sand-bank, half a mile long East and West, and 7 feet above high water. It is the resort of great numbers of birds and some turtle, and numerous whales were seen near the reef. Captain Denham, in 1858, erected a barrel-post beacon on the centre of the cay.

There is no bottom in 100 fathoms at half a mile southward of the western Bellona reef ; but to the northward of E. by S. and W.S.W. from Observatory cay, there are regular soundings over coral sand, gradually increasing from 10 fathoms at half a mile, to 35 fathoms at about 4 miles from the reef ; and irregular soundings of 5 to 19 fathoms, coral, extend W.S.W. $2\frac{1}{2}$ miles from the west extreme ; and of 7 to 10 fathoms, coral rock, 2 miles south-eastward from the east extreme of the reef.

Anchorage.—The *Herald* anchored in 11 fathoms, coral sand, between coral blocks, the centre of Observatory cay bearing South, distance half a mile.

Western Breaker, W. by S. $\frac{1}{2}$ S. $5\frac{1}{2}$ miles from Observatory cay, is a cluster of rocks just below the surface, about three-quarters of a mile long E. by N. and W. by S., and half a mile broad ; the sea breaks upon it, but at long intervals. There is a depth of 33 fathoms at two-thirds of a mile northward and north-westward of this danger, and no bottom in 50 fathoms at half a mile to the westward of it.

Caution.—Western breaker is the more dangerous from its lying so far from the main reefs, and in the direction of passing vessels ; it should therefore be approached with due caution.

The west extreme of the eastern Middle Bellona reef, lies E. $\frac{1}{2}$ S. 6 miles from Observatory cay ; the reef is 4 miles long E. by N. and W. by S., one mile broad at its ends, and half a mile at the centre. It is a lagoon reef of a crescent form, bending to the southward, and uncovers at half tide, showing some reef-stones on its south-west extreme. Captain Denham found no bottom with deep soundings, on the south side of this reef ; but there were 23 to 34 fathoms between 2 and 4 miles to the northward of it.

There is a channel 4 miles wide, with 10 to 20 fathoms, coral, between the western end of the eastern reef, and the bank of irregular soundings extending south-eastward from the western reef.

Middle Bellona reefs are connected with Booby reef to the north-westward, by a bank of soundings with 42 to 12 fathoms; the probable trend of the western 100-fathoms edge of this bank being about N.N.W. $\frac{1}{2}$ W. 25 miles from the Western breaker, to the south-east extreme of Booby reef.

Tides.—It is high water, full and change, at the Middle Bellona reefs, at 8h. 30m.; springs rise 6 feet. The flood set S.W. one knot, and the ebb N.E. three-quarters of a knot.

BOOBY REEF, the north-west extreme of which lies in lat. $20^{\circ} 57' S.$, long. $158^{\circ} 31' 53'' E.$, is 7 miles long N.W. by W. $\frac{1}{2}$ W. and S.E. by E. $\frac{1}{2}$ E., and about one mile broad, with some sunken patches close off its south-east end. With the exception of some black coral rocks, which always show 4 to 6 feet out of the water, on the southern part of this reef, it always becomes awash at half tide; but the sea breaks upon the reef at all times of tide. A detached patch lies N.N.E. three-quarters of a mile from the north-west extreme of Booby reef.

There are no soundings along the south-west side of Booby reef, but there are 17 fathoms within the embayed part of the north-east side of it. The *Herald* anchored in $4\frac{1}{2}$ fathoms, at N.W. by W. one-quarter of a mile from the north-west point of the reef.

Tides.—At Booby reef the tide streams set $1\frac{1}{2}$ to 2 knots; the flood to the S.W., and the ebb to the N.E.

N.W. BELLONA REEF, the south-east end of which lies N. by W. 6 miles from the north-west point of Booby reef, is 5 miles long N.W. by N. and S.E. by S., and about one mile broad, its north-west point lying in lat. $20^{\circ} 47' 36'' S.$, long. $158^{\circ} 28' 8'' E.$ This, like Booby reef, has no soundings along its western side; it is awash at half tide, and showed some conspicuous blocks of darkened coral on it. A patch, with breakers upon it, lies 2 miles to the north-westward of the north-west point of the N.W. Bellona reef.

From N.W. Bellona reef the probable trend of the western 100-fathoms edge of soundings is about N. by W. 48 miles to the southern end of Chesterfield reefs.

Dangerous Ground.—The space eastward of Middle Bellona and Chesterfield reefs for a distance of upwards of 120 miles, has not been surveyed; it must therefore be considered dangerous ground. Within this space lie Bellona shoal in lat. $20^{\circ} 55' S.$, long. $159^{\circ} 47' E.$, position doubtful: also Minerva shoal reported by the ship of that name in 1818; the least water obtained was 8 fathoms in lat. $20^{\circ} 50' S.$, long. $159^{\circ} 22' E.$; but shoaler water was observed to the south-west of this position. Mr. Ebury, Master of the barque *Adventurer*, reported in 1877, a rocky patch of

5 fathoms in lat. $20^{\circ} 20' S.$, long. $159^{\circ} E.$ For description of reef eastward of Bampton reef, *see* pages 440, 441.

Henry Miller reef, on which the barque of that name foundered in December 1868, is about 2 miles long in a north-west and south-east direction and a cable broad. From observations obtained while on the reef it was found to be in lat. $20^{\circ} 51' S.$, long. $158^{\circ} 2' E.$, or about 25 miles westward of North-west Bellona reef. The vessel was aground thirteen hours, during which time a rise and fall of 18 inches (neap tides), with a slight set to the north-west, was observed. The reef was awash on the north-east part, but no part appeared above water.

CHESTERFIELD REEFS and ISLETS are three long narrow barriers, extending from their south extreme, in lat. $19^{\circ} 59' S.$, long. $158^{\circ} 30' E.$, north-westward 27 miles, to their north-west point, in lat. $19^{\circ} 37' 23'' S.$, long. $158^{\circ} 13' 20'' E.$ The south-easternmost of these reefs forms an elbow, with its bight to the S.E., where the south part of the elbow is well marked by Loop islet, a small flat-tufted island, 12 feet above high-water, situated just within the reef, at two-thirds of a mile northward of the outer edge of the elbow.

The Eastern Barrier.—The barrier forming the eastern side of the elbow extends N.N.W. 9 miles, but is barely half a mile across at its broadest part. Its inner edge is bordered by numerous sunken patches, some of which rise abruptly from a depth of 18 fathoms, to within a fathom of the surface.

Anchorage Islets, which owe their name to the very smooth and secure anchorage to the westward of them, are a group of small islets on the eastern barrier. The third islet from the north, under which the best anchorage is found, is about one quarter of a mile long N. by W. and S. by E., 38 feet above high-water, and bears N. by W. $\frac{1}{4}$ W., 5 miles from Loop islet. These islets and the dry sand-ridges on the reef add to its elevation, so as to render it a natural breakwater from the eastward. All these islets are strewn with wreck.

This anchorage is much used by whalers, who during the slack season of fishing at New Zealand, &c., come here to fish, inside the reefs, where the humpback whale is found.

The South-western Barrier, from the South elbow, extends W.N.W. 7 miles to Passage islet, which is 41 feet above high-water, and takes its name from the narrow passage immediately to the north-westward of it. This barrier reef is also narrow, and extends nearly one quarter of a mile beyond Passage islet, where it forms the south-east side of the passage.*

* Passage islet is better known amongst whalers as Bennett islet, being so named after a master of a whaler who lived on it for some time, engaged in whaling and exporting the oil. The islet is now deserted.

The Passage is one-quarter of a mile wide, with 8 fathoms in its centre through which a ship may push, taking into account that a 3-knots tide stream runs through it, the ebb to the South and the flood to the North, causing such a troubled surface as might needlessly deter a ship from entering it, if this part of the Chesterfield reefs became a lee shore. Whereas by pushing through this passage, the dangers of the weather, and unfathomable western side of the barrier, will be quickly exchanged for smooth anchorage, at S.E. or N.W. of the passage, at one-quarter of a mile from the reef.

From the Passage the second south-western barrier reef extends N.W. by W. $\frac{3}{4}$ W. $4\frac{1}{2}$ miles to the north-west extreme of Long island, the north-westernmost, and principal of the Chesterfield group. This is a lagoon reef, although it is only half a mile broad; there are no soundings along the south-western side, but there are from 11 to 24 fathoms between one-quarter of a mile and half a mile from the inner edge of the reef.

Chesterfield islets are 13 in number, of which Loop and Anchorage islets, on the Eastern barrier, have already been noticed. The remaining five islets of the group are Passage islet and Long island, and three small islets between them; the latter being situated on the same reef with Long island, from the south-east extreme of which they are distant respectively one, $1\frac{1}{4}$, and $2\frac{3}{4}$ miles.

Long Island, the north-west extreme of which lies in latitude $19^{\circ} 52' 22''$ S., long. $158^{\circ} 20' 3''$ E., and from whence the north end of the east barrier reef bears E.N.E. $8\frac{1}{2}$ miles distant, is the largest and most elevated of the Chesterfield group, it being one mile long N.W. by W. and S.E. by E. and 44 feet above high-water, but is only a little more than 200 yards broad at the widest part. The surface of the island is densely covered with very large-leaved bush trees, 26 feet high, with trunks 9 inches in diameter. The interlacing of these trees made the island almost impenetrable.

A steep beach of white coral grit borders Long island, and close to its north-west end is a conical reef-stone, always above water, immediately to the northward of which is a boat passage through the reef, at half tide.

The smallest three islets, between Long island and Passage islet, vary from one to 2 cables only in extent; but they are nearly the height of Long island, being covered with bush trees, and surrounded by white sandy beaches.

Numerous birds were seen by Captain Denham on Long island, including the mutton bird, rail, and a variety of sea fowl; and various vegetables

may have been produced from the seeds sown by him on the island in 1859.

Anchorage.—The *Herald* anchored in 15 fathoms, coral rock and grit, upon a shelf projecting north-westward from Long island, with the island bearing E.S.E. half a mile, and one-third of a mile from the reef. But this anchorage cannot be recommended, as it is open to the swell from South-east.

There is good anchorage, in convenient depth of water, in the south-eastern part of the space between the Eastern and South-western barriers, sheltered from North, round East and South, to West; the chief precaution in coming-to, being apparently the selection of a sandy spot, upon which to drop the anchor, with swinging room between the sunken coral patches.


Soundings.—The greater part of the space between the eastern and south-western barriers has regular soundings in from 20 to 29 fathoms, but on the eastern side, as before remarked, numerous coral patches were seen, for which a good look-out must be kept from aloft, as they rise too abruptly from deep water to admit of the lead giving any warning when approaching them. One of these sunken patches lies E. $\frac{1}{4}$ N. $4\frac{1}{4}$ miles from the north-west end of Long island, and N. by W. $2\frac{1}{4}$ miles from Passage islet: it is very dangerous, even for boats, being difficult to discern on account of its dark colour.

Tides.—It is high water, full and change, at Long island at 8h. 30m.; springs rise 5 feet. The flood stream sets S.W., and the ebb N.E., 2 to 3 knots per hour.

Long Island Passage is an opening, $2\frac{1}{4}$ miles wide, between Long island and the south point of the western barrier of the Chesterfield reefs; the south side of the channel has a depth of from 10 to 17 fathoms, extending a little more than one mile north-westward of Long island, the remainder of the passage appears to be very deep.

The Western Barrier of the Chesterfield reefs extends from Long island opening N.W. by N. 15 miles to the N.W. point; it is one mile broad near its southern end, where it encloses a lagoon $1\frac{1}{4}$ miles long, between the south point of the barrier and a cay at $1\frac{1}{4}$ miles to the northward of the point. Except at this lagoon, the barrier averages only one-quarter of a mile in breadth, with small dry sand-cays and conspicuous coral blocks, but chiefly awash. There is no bottom in 200 fathoms, at half a mile off the western side of this barrier.

From the N.W. point of Chesterfield reefs a sunken barrier, on which are situated the two Avon isles, extends N. by E. 9 miles to the south point of Bampton reef.



The opening over this sunken barrier, between the N.W. point of the Chesterfield reefs and the southern Avon islet, is 5 miles wide, with from 4 to 17 fathoms water; the abrupt rise of this shelf, or sunken barrier, causes a remarkable tide ripple or overfall upon it.

AVON ISLES, the southern of which lies in lat. $19^{\circ} 32' 5''$ S., long. $158^{\circ} 15' 27''$ E., are each about 170 yards in diameter, and including the bushes on them, 17 feet high. Each islet is fringed by a reef, but not of sufficient spread to afford sheltered anchorage near it.

Avon isles are densely covered with stunted trees, creeping plants, and grass; and are crowded with the like kind of birds as seen at the Chesterfield group. Captain Denham, sowed some vegetable seeds on the southern islet.

The channel between the two Avon isles is $1\frac{1}{4}$ miles wide, with depths of 9 to 13 fathoms; and that between the northern islet and the south point of Bampton reef $1\frac{1}{2}$ miles wide, with 4 fathoms, if not a greater depth of water in it. The *Herald* anchored in 9 fathoms, mid-way between the two islets.

TIDES.—It is high water-full and change, at Avon isles, at 8h. 30m.; springs rise 5 feet, neaps $2\frac{1}{2}$ feet. The stream in the channel where the *Herald* anchored, ran 2 to 3 knots; the flood to the S.W., and the ebb to the north-eastward.

BAMPTON REEF is the western edge of a bank of soundings extending to the Chesterfield reefs, the eastern limits of which have been but partially surveyed. This reef forms a narrow barrier, trending from its south point N. by E. 22 miles, when, after a turn of 3 miles to the eastward, it extends N. by W. 7 miles to the north-west elbow of Bampton reef, in lat. $19^{\circ} 1' 19''$ S., long. $158^{\circ} 27' 3''$ E.

This Bampton barrier is a low double-edged reef, with here and there a cluster of reef-stones and an occasional solitary rock, standing up 6 feet, which when first seen on the horizon, have, from their leaning attitudes, the appearance of lug-sail boats.

These rocks serve as beacons at the distance of 6 or 8 miles; whilst the reef itself—if without breakers, from the effect of swell—might not be discerned until too dangerously near. Small sand-cays were also observable on the southern part of the reef, tending to show up this leeward and consequently quiet barrier.

There are no soundings close along the western side of the Bampton barrier; but a rocky shelf projects a short distance from the north elbow, on which the *Herald*—for a scientific purpose only—anchored in 19 fathoms, at one cable's length from the reef.

BAMPTON ISLAND,* situated about 10 miles south-eastward of North elbow, in lat. $19^{\circ} 8' S.$, long. $158^{\circ} 36' 35'' E.$, is 200 yards long and 120 yards broad; its height, including the bushes, being 17 feet. It is surrounded by the usual fringe reef, extending to a distance of 400 yards from the shore on the east side, and to 150 yards on the remaining sides.

Anchorage may be obtained in from 6 to 10 fathoms on a patch on the West side; the centre of the island bearing N.E., distant one mile.

Sand Cay.—At 2 miles West from Bampton island is a sand cay, always uncovered, 100 yards long, lying on the eastern edge of a circular reef, one mile in diameter, having an opening in the West side, and depths of 3 to 5 fathoms within, tolerably clear of patches.

Between Bampton island and this sand cay the depth varies from 17 to 39 fathoms; but northward of the island the depth suddenly increases considerably. To the southward of Bampton island for a distance of about 2 miles, the average depth is 26 fathoms, coral grit.

North Bampton reef.—At a distance of 3 miles N.E. from Bampton island is the commencement of the North Bampton reef, which, from this point, extends $4\frac{1}{4}$ miles in a north-east direction, thence to the south-eastward and eastward for $5\frac{1}{4}$ miles, terminating in a sand cay in lat. $19^{\circ} 4' 40'' S.$, long. $158^{\circ} 48' 50'' E.$

Eastward of this cay is a passage, 2 miles across, with 7 to 14 fathoms, coral bottom, to the edge of another reef which extends in a northerly direction in broken patches for a distance of 8 miles, to the extreme North point of Bampton reef, which forms an elbow, or sharp point, in lat. $18^{\circ} 56' 30'' S.$, long. $158^{\circ} 52' E.$ The eastern side, extending to a distance of $9\frac{1}{4}$ miles in a south-east direction, whence, at a distance of one mile in an easterly direction, is a small horse-shoe reef, the curve being one mile in length.

North-east Bampton reef.—At one mile S.E. from this horse-shoe reef is the East extreme of North-east Bampton reef, which trends $2\frac{1}{4}$ miles in a S.E. direction, thence sharply to the S.W. for the same distance, thus forming a right angle, having a sand cay (always uncovered) at the right angle, and three small cays in the northern portion.

Anchorage.—Fair anchorage was obtained in 14 fathoms, coral, within this reef, with the large cay bearing E. by N. $2\frac{1}{4}$ miles. Foul ground extends about $1\frac{1}{4}$ miles from this cay.

* Information relating to Bampton island and reefs, furnished by Lieutenant G. E. Richards, commanding H. M. Schooner *Renard*, 1878.

The English barque *Banda* was entirely lost on the 21st May 1877, on the north-east elbow of Bampton reef. The crew reached port Denison and port Bowen in safety in two boats.

RENARD ISLAND, in lat. $19^{\circ} 13' 35''$ S., long. $158^{\circ} 56' 40''$ E., lies $4\frac{1}{4}$ miles from the south end of North-east Bampton reef, and resembles the Avon isles. It is 300 yards long, 200 yards broad and 20 feet high, including the bushes. Renard island is surrounded on all sides except the west with a fringe reef extending 300 yards from the shore.

Anchorage can be obtained on the N.W. or west sides of Renard island, sheltered from south-easterly winds, in 9 to 14 fathoms, care being taken to avoid a rocky patch (which can easily be seen from the mast-head) with 9 feet on it at low-water. From this patch the centre of Renard island bears E. by N. $\frac{1}{4}$ N., distant one mile.

South-east Bampton reef.—At $3\frac{1}{4}$ miles S.E. by S. from Renard island is the north extreme of South-east Bampton reef, which extends in a southerly direction for 10 miles; south-westward of the south-extreme of this reef is a patch of coral having a sand cay in the centre, on which the party from the *Renard* discovered two skeletons.

At 5 miles S.W. from this cay are some detached reefs, which did not appear to extend for any considerable distance; but it seems probable that they continue southward to lat. $19^{\circ} 50'$ S., the parallel in which the master of the *Velocity* reported having seen breakers, in 1876.

Winds and Weather.—From the beginning of April to the early part of May winds from S.E. to E.S.E. were experienced. After that time to the middle of May the wind was not so steady, veering to E.N.E., accompanied by rain. South-westerly squalls with rain were occasionally experienced, but did not last long. South-easterly winds, force 3 to 5, were accompanied by fine weather.

Currents.—The prevailing current was observed to run to N.W. and W.N.W., about $1\frac{1}{2}$ knots; but close to the reefs southerly and south-westerly currents were sometimes experienced.

Tides.—As far as could be judged, the flood tide sets to the south-west, the ebb to the north-east, but no satisfactory result could be obtained. It is high water, full and change, at Renard island at 8h. 20m.; springs rise 5 feet (approximate).

FAIRWAY REEF, thus named from its lying midway between the Bellona shoals and New Caledonia. It is coral, is about $1\frac{1}{4}$ miles in circumference, and awash at half-tide, the rise of tide being 3 feet. Lat. $21^{\circ} 0' 15''$ S., long. $161^{\circ} 45' 9''$ E.

Darling reef.—Mr. Williams, master of the *Lady Darling*, reports, in January 1879, in lat. $20^{\circ} 22'$ S., and $162^{\circ} 20'$ E., passing over the tail of a bank which appeared to extend one mile E.S.E., he obtained no soundings, but judges the depth to be from 4 to 5 fathoms.

Nereus shoal, in about lat. $20^{\circ} 5'$ S., long. $160^{\circ} 30'$ E., as reported, is said to have 2 fathoms water on it. See Footnote, page 461.

Breakers.—In 1876 the master of the whaler *Velocity* reported, that while cruising on the eastern side of the Chesterfield and Bampton reefs, he observed heavy breakers in lat. $19^{\circ} 50' S.$, long. $158^{\circ} 50' E.$

Sandy islets.—The master of the *Velocity* also reported a line of sandy islets as extending about North and South along the meridian of $159^{\circ} 57' E.$, between lat. $19^{\circ} 7' S.$, and $19^{\circ} 20' S.$

Soundings.—Few soundings only were obtained on the bank between Chesterfield and Bampton reefs. There are 16 to 30 fathoms within a space of 2 miles eastward of Long island opening, from whence there are 19 to 26 fathoms to the eastern 100-fathoms edge of the bank, N.E. by E. 11 miles from the opening.

Within a space of about 5 miles eastward of the Avon isles there are 17 to 27 fathoms, with 6, 7, and 8 fathoms patches between them; from these soundings to the eastern 100-fathoms edge of the bank, at 17 miles north-eastward of the islets, there are 23 to 32 fathoms.

MELLISH REEF is a lagoon-reef 6 miles long N. by W. and S. by E., and half a mile to $1\frac{1}{4}$ miles broad, having at $2\frac{1}{4}$ miles from its south extreme a bright sandy cay, $6\frac{1}{2}$ feet above high-water level, upon which Captain Denham, in 1859, erected a conical beacon 32 feet high, or nearly 39 feet above high-water, from the wreck of H.F.I.M. St. S. *Duroc*, lost on the reef in 1857. The beacon stands in lat. $17^{\circ} 24' 39'' S.$, long. $155^{\circ} 53' 25'' E.$

Mellish reef is somewhat curved, projecting to the eastward, and having an indentation $2\frac{1}{4}$ miles broad and one mile deep, on the west side. The margin of this reef forms a narrow barrier, awash at half tide, with a few of its coral rocks, and the boilers and machinery of the *Duroc*, which lie $1\frac{1}{4}$ miles southward of the cay, always above water. The sea breaks heavily on the eastern side, and slightly on the other parts of the reef.

Soundings.—With the exception of two casts of 200 and 210 fathoms at half a mile from the south-east side, there are no soundings with 200 fathoms at that distance from the reef; but in the bay on the west side, there is a shelf of irregular soundings of from 3 to 20 fathoms, between numerous sunken patches, extending from a quarter of a mile to two-thirds of a mile from the edge of the reef.

Anchorage.—There is anchorage on this shelf, the best being in the southern part of the bay, where the *Herald* anchored on three occasions, in a clear space one quarter of a mile in extent, with from 6 to 10 fathoms, coral sand, between the sunken patches, at one mile south-westward from the cay, where there is shelter from swell and sea, from N.N.W. round eastward to S.W.

DIRECTIONS.—To enter the *Herald's* anchorage with a south-easterly wind, steer for the cay, or the beacon on it, bearing N.E., passing close to the south point of the bay, and between the olive-tinted reflection over two 15-foot patches. When nearly one-quarter of a mile N.E. by N. of the point, haul boldly up E.S.E., and whilst shortening sail the vessel will be in 9 fathoms, where she may anchor about a cable north-eastward of the southern 15-foot patch, with the cay bearing N.E. $\frac{1}{2}$ N. nearly one mile distant, and one-quarter of a mile from the reef.

The lagoon enclosed by Mellish reef has irregular soundings in from one to 8 fathoms, with sunken coral patches, the deepest water being to the northward of the cay. The only entrance to the lagoon is by a small boat-passage, at one-third of a mile south-westward of the cay.

The Cay on Mellish reef is 170 yards long North and South, and 120 yards broad, where the surface is covered with coarse grass; and being $6\frac{1}{2}$ feet above high water, and protected from the sea by its barrier reef, it affords ample space for the encampment of a shipwrecked crew, while preparing for a passage to the mainland. Numerous birds were seen; and Captain Denham sowed a variety of vegetable seeds on the cay.

TIDES.—It is high water, full and change, at Mellish cay, at 7h. 55m.; springs rise $5\frac{1}{2}$ feet.

NORTH-WEST REEFS.—The reefs forming the eastern bounds to the Outer route having been described, the north-western portion of those on the western side will be next noticed, commencing with the reported Marion reef, the next danger bordering the route to the north-westward of Kenn and Frederick reefs.

Marion or Paget reef.—In 1868 Mr. C. Paget, master of the schooner *Marion*, reported, that he had sailed along the edge of a reef about 30 miles long N.E. and S.W., on which were three large sand-banks above water. The north-east end of the reef was in lat. $18^{\circ} 52'$ S., long. $152^{\circ} 41'$ E.

Wansfell reefs are two patches reported in 1864 as lying between Marion reef and the outer edge of the Great Barrier reef, in lat. $19^{\circ} 20'$ S., long. 152° E., and lat. $20^{\circ} 5'$ S., long. $151^{\circ} 5'$ E. See p. 414.

LIHOU REEF AND CAYS, of which such confused accounts were given respecting its connexion with Alert reef to the north-eastward, and Vine bank and Governor Farquhar group to the south-westward, previous to its being surveyed by Captain Denham in 1859 and 1860, when he found no other reefs in this locality than that now known as Lihou reef, which extends from its north-east extreme, in lat $17^{\circ} 10' 30''$ S., long. $152^{\circ} 12' 40''$ E., S.W. $\frac{1}{2}$ W. 56 miles. The north-east end and south-east side only have been surveyed; but a bank of soundings, about 15 miles broad, is supposed to extend the whole length of the reef, on the north-west side.

The reef forming the north-east end of this extensive danger to navigation, is of a horse-shoe shape, with Observatory cay, a bright sand-bank, on the north-western point of the reef: the two points of the reef are 6 miles apart and project to the south-westward. The bight within this reef appears not to have been closely sounded; but there are 15 to 30 fathoms, coral sand, between 15-foot patches, westward of the bight, where the *Herald* anchored in 15 fathoms, with Observatory cay bearing North three-quarters of a mile, sheltered from the swell by the reefs.

Observatory cay is a coral sand-bank 400 yards in extent 6 feet above high water, and lies in lat. $17^{\circ} 7' 15''$ S., long. $152^{\circ} 6' 20''$ E. An abundant supply of green turtle may be obtained on this and on the adjacent cays, especially in the month of September, which appears to be the season when they land on these cays to deposit their eggs.

From Observatory cay a chain of coral reefs, without any bottom in 230 fathoms at one-quarter of a mile outside them, extends W. $\frac{1}{4}$ S. 15 miles, and was traced 5 miles farther south-westward, apparently continuing in that direction, along the north-western edge of the bank of soundings of Lihou reef. There are five conspicuous cays on the reef, between Observatory cay and 14 miles westward of it; the only one which showed any herbage on it is 19 feet high; but none of the bare cays exceed 6 feet above high water.

From the east extreme of Lihou reef the chain of small detached reefs, which form the south-east side or barrier, sweeps round 18 miles south-westward to Herald's passage, and from thence in a S.W. $\frac{1}{2}$ W. direction 39 miles to the south-west extreme of Lihou reef, in lat. $17^{\circ} 39' 13''$ S., long. $151^{\circ} 22' 51''$ E.

Herald passage, in the entrance of which that ship anchored in $4\frac{1}{2}$ fathoms, is $1\frac{1}{2}$ miles wide, with a 4 and 5 fathoms ridge across it, within which where there are 20 and 30 fathoms.

Between Herald passage and the fourth sand-cay from the south-west extreme of Lihou reef, the barrier, for a distance of 25 miles, consists of a chain of reefs, on which were seen four sand-cays of from 400 to 600 yards in diameter; one of these, at about 6 miles south-westward of Herald's passage, is an islet 8 feet high. Between these reefs there are ten openings, which are from one cable to half a mile wide; they were not sounded, but the dangerous coloured water in them should deter any ship from using them, except as a forlorn hope.

From the fourth sand-cay, just noticed, the barrier continues S.W. $\frac{1}{2}$ W. 14 miles to the south-west extreme of Lihou reef, between which were discovered five openings of doubtful safety for ships to enter.

SOUNDINGS.—No bottom was found at 100 fathoms, close outside this south-east barrier of the Lihou reef, except abreast of the fourth

sand-cay from the south-west extreme of the reef, where there are 35 fathoms at 2 cables' off the fringe reef of the cay. The *Herald* anchored within the south-west extreme of Lihou reef, where there are 8 to 28 fathoms. Two detached patches were seen upon the supposed bank of soundings within the south-east barrier; one, of which the position is doubtful, bearing W. by S. 11 miles, and the other, S.W. by W. $\frac{1}{2}$ W. 12 miles from the islet, 8 feet high, before noticed.

TIDES.—It is high water, full and change, at Observatory cay, at 8h.; springs rise 6 feet. At the *Herald's* anchorage, near the cay, the flood stream sets South $1\frac{1}{2}$ knots; and in *Herald's* passage the flood sets outwards and the ebb inwards as at the windward chains of reefs.

Tregrosse islets and reefs, as shown on the Admiralty charts, lie about 37 miles W. by S. from the south-west extreme of Lihou reef. They have not been surveyed; but are supposed to consist of two small islets, lying North and South, 4 miles apart and surrounded by a reef; the southern islet being in lat. $17^{\circ} 43'$ S., long. $150^{\circ} 43'$ E. Two reefs of this group are represented as lying W.S.W. about 6 and 13 miles from the southern islet.

Coringa islets are two sand-cays, lying E.N.E. and W.S.W., 8 miles apart. Chilcott islet, the north-eastern cay, on which the *Coringa* packet was lost in 1845, lies in lat. $16^{\circ} 50'$ S., long. $149^{\circ} 58'$ E. The islet is about 10 feet high and surrounded by a reef, which in some parts dries at low water; the whole danger is about $4\frac{1}{2}$ miles in circumference. In 1846, Mr. Mackenzie, the master of the schooner *Heroine*, anchored under the lee of the islet in 10 fathoms, fine sand, and planted some cocoa-nut trees.*

MAGDELAINE CAYS, about 23 miles to the north-eastward of Chilcott islet, were discovered by an officer of the *Duroc*, on his passage with two open boats from Mellish cay to Timor in 1856. They were partially surveyed by Captain Denham in 1860, who found them to consist of an islet in lat. $16^{\circ} 35' 47''$ S., long. $150^{\circ} 19' 46''$ E., and a sand-cay lying N.N.W. $\frac{1}{2}$ W. 6 miles from the islet. The southern islet is 23 feet high, covered with herbage, and fringed by a reef one mile in extent, with 20 fathoms, coral, at 4 miles to the westward of it.

* The schooner *Frolic* was sent by the government of New South Wales to the rescue of a portion of the crew of the *Coringa* packet, left on the islet; and from the important nature of this service, she was conducted by a competent navigator; her track was therefore a useful addition to the chart, as it diverged considerably from the usual route, and passed several new dangers.

On passing the western Tregrosse islet and reef, their positions were found to agree very closely with the *Frolic's* latitude and longitude; there was a similar agreement with the Coringa islets, which was also verified by Mr. Dobson, of the schooner *Ariel*, in 1849.

The Sand-cay to the north-westward, is surrounded by a reef $2\frac{1}{2}$ miles long. E.N.E. and W.S.W. with no bottom at 200 fathoms close to the north-westward; but there are 190 fathoms near the north-east part of the reef, and 220 fathoms at about 3 miles to the south-westward of it.

WILLIS GROUP, discovered in 1853 by Mr. Pearson, commanding the ship *Cashmere*, consists of three islets, situated nearly in line North and South, on the eastern and northern edges of a bank 13 miles long and 5 miles broad.

Birds, similar to those which frequent the other islets in this sea, were numerous on Willis islets; and an abundant supply of green turtle was procured by Captain Denham on Middle islet, in the month of February.

South Islet, in lat. $16^{\circ} 16' 48''$ S., long. $150^{\circ} 1'$ E., is 33 feet above high water; its surface, which is about 400 yards in extent, is covered with grass, showing a sharp contrast with the broad belt of bleached coral sand which surrounds it. This islet is situated on the northern horn of a crescent-shaped half-tide reef, extending one-quarter of a mile to the northward and one mile to the southward from the islet; the two horns of the reef pointing to the westward.

All but the south-east outer edge of South islet reef is bordered by sunken patches and irregular soundings of from 3 to 19 fathoms, extending from one-quarter of a mile southward to half a mile north-westward, and about 2 cables' lengths northward and north-eastward from the reef. Between S.S.W. 3 miles, and N.W. one mile from South islet, there are 24 to 30 fathoms, coral sand.

Middle Islet, N. by E. $\frac{1}{4}$ E. 4 miles from South islet, is somewhat smaller, but of similar aspect to South islet; it is 25 feet above high-water, its surface is covered with grass surrounded by a coral sandy beach, and it is situated on the western edge of a flat half-tide reef, nearly half a mile in extent.

A rocky spit, with 4 to 5 fathoms on it, extends N.W. by N. two-thirds of a mile from the northern edge; and foul ground, with sunken patches and irregular soundings in from 2 to 17 fathoms, W.N.W. half a mile, W.S.W. three-quarters of a mile, and South half a mile from the south-west extreme of the reef. Between the northern spit and a 4-fathoms rock, lying W. $\frac{1}{4}$ N. half a mile from the islet, there is a small bight in the foul ground with from 9 to 20 fathoms water in it, and 14 fathoms within 2 cables' of the north-west side of Middle islet.

South Passage.—There is a safe ship passage 3 miles wide, with 7 to 20 fathoms, between the foul ground extending from South and Middle islets. Although the flood stream causes a dangerous-looking overfall of broken water in this passage, a stranger need not hesitate to pass through it, taking care not to pass within a mile of the reefs.

North Cay, N. $\frac{1}{2}$ W. $5\frac{1}{2}$ miles from Middle islet, is a narrow sand-bank three-quarters of a mile long East and West, with a smaller cay close to the westward of it. It is situated on the northern edge, and $1\frac{1}{2}$ miles eastward of the north-west horn of a crescent-shaped reef, sweeping round from the cay eastward and southward to the south-east horn of the reef.

North Cay reef, which dries at half-tide and is always breaking, is two-thirds of a mile broad at the cay, from whence it gradually narrows towards its two horns, close off the north-western of which is a small sunken patch.

From half a mile southward of the cay to half a mile south-westward of the south-eastern horn, the inner part of the reef is fronted with foul ground, with numerous sunken coral patches and irregular soundings in from 2 to 9 fathoms, leaving only a small bight trending in from the north-westward, with 9 fathoms at $1\frac{1}{2}$ miles south-eastward of the cay.

The opening between the foul ground extending from Middle islet, and North cay reefs is divided into two channels by a dangerous patch, the southern end of which is 2 miles northward of Middle islet. This bank of foul ground has a small reef awash, on which the sea breaks, on its eastern edge, with sunken rocks and irregular soundings of from 6 to 20 fathoms on other parts of it.

Northern Passage.—The channel between Middle islet and the dangerous patch is $1\frac{1}{4}$ miles wide, with 8 and 9 fathoms across its entrance, within which the depth quickly increases to irregular soundings in from 14 to 23 fathoms.

The channel between the patch and the foul ground extending from North cay reef, is two-thirds of a mile wide, with 10 fathoms across it; but it has not been sounded within its entrance.

Soundings.—No bottom could be reached with 200 fathoms, at 3 miles south-westward of South islet, nor from thence close along the eastern and northern edges of Willis reefs; but soundings in from 10 to 31 fathoms are found between the south extreme of the bank and North cay reef, extending about 4 miles westward from the eastern edge of the bank, between Middle islet and North cay reef.

Anchorage.—Before anchoring under the lee of Willis reefs, a sufficient space of clear ground, which will be best seen from the mast-head, should be found, where a ship may swing and get under way without fouling of the coral rocks which rise abruptly to within 2 or 3 fathoms of the surface. The *Herald* anchored in 25 fathoms, coral sand, in an unsheltered berth South $2\frac{1}{2}$ miles from North cay.

Tides.—It is high water, full and change, at Willis islets at 8h.; springs rise 6 feet.

DIANA BANK, discovered by M. Bougainville in 1768, and said by him to lie in lat. $15^{\circ} 46'$ S., long. $151^{\circ} 28'$ E., is thus described in the narrative of the voyage: "On the night of the 4th June 1768 we had been steering to the westward under topsails, there being a bright moon shining. At 11 p.m. we discovered about $1\frac{1}{2}$ miles southward of us some rocks and a very low sandy coast. We immediately stood to the north-east until 5 in the morning, when we altered course to the W.S.W. for the danger seen at night; at 8 a.m. we tacked off the danger, $4\frac{1}{2}$ miles distant. It is a little islet of sand just above water, covered with birds, and only visible about 6 miles from the mast-head in a clear day."

BOUGAINVILLE REEFS, discovered by M. Bougainville in 1768, and laid down by him as being in lat. $15^{\circ} 12'$ to $15^{\circ} 36'$ S., long. $148^{\circ} 59'$ to $149^{\circ} 8'$ E., are thus described in the narrative of the voyage: "On the 6th June 1768 at 1.30 p.m. observed a reef about 2 miles ahead of us, it was less than $1\frac{1}{2}$ miles long from W. $\frac{1}{4}$ S. to W.N.W.; some of us thought they saw a sand-bank on the south-west side of the breakers. Altered course to the northward and at 4 p.m. steered to the westward again; at 5.30 the look-out man at the mast-head saw breakers to the north-west about 4 miles distant. On approaching nearer we found the reef extending upwards of 2 miles N.N.E. and S.S.W.; we could not see the end, perhaps it joined the reef we saw earlier. The sea broke with fury over these reefs, some heads of which showed above water."*

* Captain Denham in H.M.S. *Herald*, 1860, searched for the Diana bank in lat. $15^{\circ} 41'$ S., long. $150^{\circ} 25'$ E., the position assigned to it by Captain Flinders, and could find no signs of the bank within 30 miles east and west, and 10 miles north and south of that position.

Bougainville reefs were also searched for by Captain Denham in from $15^{\circ} 12'$ to $15^{\circ} 35'$ S., long. $148^{\circ} 0'$ E., the position assigned to them by Captain Flinders. Ten days were devoted to a careful search for these reefs, over a space extending from the parallel of $16^{\circ} 20'$ to $14^{\circ} 40'$ S., and from the meridian of $147^{\circ} 10'$ to $148^{\circ} 50'$ E.

As Captain Denham could not discover any signs of either of these dangers, the conclusion he arrived at was, that the Diana bank of Bougainville was the north cay of the recently discovered Willis group, and Bougainville reefs the present Holmes reefs. The first difference being one of 28 miles in latitude and 86' of longitude, the second 45 miles of latitude and 70' of longitude, using the latitudes and longitudes given by Bougainville.

These great differences are difficult to reconcile, especially in the latitudes, for although chronometers were in their infancy at that time, and great mistakes in longitude might have occurred, yet the method of obtaining the latitude was well known, and Bougainville reefs were first seen only $1\frac{1}{2}$ hours after noon.

On consideration of the above circumstances, it would appear that the Diana bank and Bougainville reefs, may still be found not far from the position given to them by Bougainville.

OSPREY REEF, discovered in 1844, is the north-westernmost danger bordering the Outer route to Raine island, on the western side. It is a lagoon reef, forming nearly an equilateral triangle, with sides 5 miles long; its east angle, or weather elbow, the most projecting part of the reef towards the Outer route, being in lat. $13^{\circ} 51' 10''$ S., long. $146^{\circ} 36'$ E., the two western angles lying N. $\frac{1}{2}$ W. and S. $\frac{1}{2}$ E. from each other.

The three sides of Osprey reef are smooth on the surface, and barely show at half tide; but three black coral blocks were seen about 2 feet above water. With the prevailing south-east wind, the sea breaks heavily on the south-east side, and moderately on the north-east side, whilst there are no breakers on the west or lee side of the reef, which slightly curves inwards.

Osprey reef affords no anchorage, as there are no soundings in 150 fathoms, one-quarter of a mile outside any part of it. The lagoon enclosed by this reef is a smooth sheet of water, where boats, and probably small vessels, may anchor in 2 or 3 fathoms, bright coral sand; the entrance is about half a mile wide, and lies half a mile inside of the south-west angle of the reef.

CAUTION.—When Captain Denham surveyed Osprey reef in 1860, the *Herald* slightly touched on the western, or lee edge of the reef, just before daylight, when there was not enough swell to cause warning breakers on the reef; it should therefore be cautiously avoided by passing vessels.

Tides.—It is high water, full and change, at Osprey reef at 8h. 36m.; springs rise 6 feet.

Dragon Bank, on which 14 fathoms were reported to have been found by the brig *Dragon*, and said to lie in lat. $11^{\circ} 49'$ S., long. $145^{\circ} 49'$ E., was searched for by Captain Denham in 1860, and found not to exist in the position assigned to it.

The dangers which bound both sides of the Outer route, from the parallel of 24° S. to Raine island, having been described, the only reefs which remain to be noticed are those which lie between Willis group and the Great Barrier reefs, far to the westward of the usual track of vessels through the Outer route.

FLINDERS REEFS, discovered by Captain Flinders in 1802, were examined by Captain Denham in 1860, who places their south extreme in lat. $17^{\circ} 53' 30''$ S., long. $148^{\circ} 28'$ E. From thence the reefs, upon which there are heavy breakers, extend 20 miles to the northward, the north-eastern projection lying in lat. $17^{\circ} 39' 50''$ S., long. $148^{\circ} 34'$ E.

MALAY REEF, discovered in 1876 by Mr. Love, master of the American barque *Malay*, is described as being about one mile in circum-

ference, and as lying in lat. $17^{\circ} 58'$ S., long. $149^{\circ} 20'$ E., or about 45 miles eastward of Flinders reef. The position assigned to this reef is considered correct, as the Malay took a departure from Herald cay the day previous to sighting the reef.

Herald's Surprise, in lat. $17^{\circ} 21' 18''$ S., long. $148^{\circ} 28' 50''$ E., is a small reef with breakers on it, and no bottom in 230 fathoms close to the northward of it. This danger was discovered by Captain Denham in 1860, when the *Herald* narrowly escaped being lost on it.

Herald Cays, are two small islets lying N.E. $\frac{1}{4}$ E. and S.W. $\frac{1}{4}$ W. $3\frac{1}{4}$ miles apart: the north-eastern cay, which lies in lat. $16^{\circ} 55' 52''$ S., long. $149^{\circ} 12' 56''$ E., is 23 feet high, and covered with herbage; its fringe reef being nearly $1\frac{1}{4}$ miles in diameter. There is no bottom in 230 fathoms at 8 miles to the south-eastward, nor at 4 miles to the north-eastward of the cays.

HOLMES REEFS, discovered in 1854, were examined by Captain Denham in 1860, who places the south extreme of the western, and main body of the reefs in lat. $16^{\circ} 30'$ S., long. $147^{\circ} 47' 41''$ E., from whence they extend N.N.E. 8 miles. There is no bottom in 230 fathoms, close to the North and South of these dangers. The eastern of the Holmes reefs, which lies 7 miles from the western reefs, is 5 miles long N.E. and S.W., with no bottom in 220 fathoms close to its south extreme.

The OUTER ROUTE, from the parallel of 24° S. to Raine island, is bounded to the westward and northward by Cato bank, Wreck, Kenn, and Lihou reefs, Willis group, and Osprey reef; and to the eastward by Bellona, Henry Miller, Chesterfield, Bampton, and Mellish reefs; the narrowest part, between Kenn and N.W. Bellona reefs, being 147 miles across. Captain Denham could obtain no bottom with 200 fathoms in any part of the Outer route, nor did he experience any current to effect a ship, whilst 60 miles off the Great Barrier reefs.

EASTERN FIELDS, discovered by Captain Flinders, in the Colonial schooner *Cumberland*, are a group of detached reefs, with their north-eastern extreme in lat. $10^{\circ} 2'$ S., long. $145^{\circ} 45'$ E. Their extent to the southward and westward is uncertain; but as laid down on the chart by Captain Flinders, they extend at least 20 miles to the westward, from the north-east extremé. The *Cumberland* passed through the reefs; but as little or nothing is to be gained by such a route, it is not to be recommended, more especially as the north-eastern extreme of the Eastern fields is so accurately laid down, as to afford a fair point of departure for making Bligh entrance, by a vessel proceeding westward through Torres strait.

BOOT and PORTLOCK REEFS.—These reefs together with others extending to the southward, form a chain of imperfectly-known reefs lying about midway between the Eastern fields and the Great Barrier reefs, and nearly parallel with the latter.*

The southernmost extreme of this chain of reefs, seen in the ships *Claudine* and *Mary*, in 1818, was in about lat. $10^{\circ} 28' S.$, long. $144^{\circ} 27' E.$, from whence they appeared to trend to the northward 11 miles, and then join the reefs seen by Mr. Ashmore in 1811, which continue, northward, to lat. $10^{\circ} 4' S.$, or abreast of the southern part of Boot reef.

The southern portions of Portlock and Boot reefs, and those seen farther to the southward have not yet been surveyed; but the northern extreme of Portlock reef was traced by H.M.S. *Fly*, when many of the positions determined by Captain F. P. Blackwood, were found to agree in a very satisfactory manner with those of Captains Bligh and Flinders.

Boot Reef—so named by Captain Flinders who discovered it in 1803—lies about 6 miles to the eastward of the northern extreme of the reefs, just described as seen by Mr. Ashmore. The north extreme of Boot reef is in lat. $9^{\circ} 58' 30'' S.$, long. $144^{\circ} 41' E.$, according to Captain Flinders, who describes it as being about 7 miles long, N.N.E. and S.S.W., and from 2 to 3 miles broad; its form is nearly that of a boot, and the outer edges are probably dry at low tide; but there is a considerable space within, where the water looked blue as if very deep. Captain Flinders could find no bottom with 70 fathoms, under the lee of this reef, at the distance of a mile. Some other detached reefs were seen by Mr. Ashmore, extending from 2 to 6 miles to the south-eastward of Boot reef.

Portlock Reefs, discovered by Captain W. Bligh and Lieutenant N. Portlock, commanding H.M.S. *Providence* and *Assistant*, in 1792, form the northern portion of this extensive chain. Its northernmost extreme consists of a lagoon reef, in lat. $9^{\circ} 28' S.$, long. $144^{\circ} 53' E.$, from which portions of the edge of the reefs, with the sea breaking on them, were found by H.M.S. *Fly*, to extend nearly S.W. by W. 10 miles, and from thence to trend 5 miles in a southerly direction. Captain Flinders, in 1802, saw a continuation of these reefs, extending to the southward as far as lat. $9^{\circ} 49' S.$, long. $144^{\circ} 45' E.$

PANDORA PASSAGE is apparently an opening free from dangers, 10 miles wide, between the southern termination of the Portlock reefs just described, and Boot reef; the centre of the passage being in lat. $9^{\circ} 54' S.$, long. $144^{\circ} 43' E.$

The sea between the chain of reefs just described, and the Great Barrier reefs, appeared to be free from dangers for at least 20 or 30 miles to the

* See Admiralty chart, Torres strait, sheet 2, No. 2,422; scale, $m = 0.25$ of an inch.

eastward of the barrier; the depth of water was not ascertained to the southward of Flinders entrance; but between Portlock reefs and that entrance there were regular soundings, varying from 64 to 37 fathoms, with coral sand and shells; to the northward of these soundings, the depth of water becomes less, with more even bottom.

DIRECTIONS FOR THE OUTER ROUTE, FROM SYDNEY TO TORRES STRAIT.

The navigator is recommended to refer to the last chapter before deciding upon which route he will take from Sydney to Torres strait; although it is presumed he will now scarcely hesitate in choosing the Outer route, since Captain Denham, in his late survey of the Coral sea, has determined the positions and extent of all the reefs which border the route, and has cleared the chart of many supposed rocks and shoals, which caused nearly as much perplexity as real dangers: and as the same chapter commences with the description of the winds and currents off the east coast of Australia, it is not deemed necessary to again revert to the subject, farther than to repeat that the proper season to make the passage from Sydney to Torres strait, by the Outer, as well as the Inner route, is considered to commence on the 1st of April and to end with the month of August.

Vessels after leaving Sydney, or any of the southern colonies, for Torres strait, are recommended to make the most direct course to approach the southern entrance of the Outer route on the parallel of 24° S., and the meridian of 157° E. It being presumed that the vessel is navigated by chronometers, with well-known errors and rates, there would be no object in sighting either Cato islet, Bird islet on Wreck reef, or Observatory cay on Kenn reef.

Having crossed the parallel of 24° S. in long. 157° E., steer N. by $W \frac{1}{4} W$, 170 miles, when the vessel will have passed 70 miles eastward of Cato bank and Wreck reef, and will be in lat. $21^{\circ} 10' S$., long. $156^{\circ} 45' E$., or 50 miles eastward of Kenn reef. The next course will be nearly N.W. $\frac{1}{4} W$. 430 miles, to lat $15^{\circ} 30' S$., long. 152° E., passing 50 miles eastward of Lihou reef.*

RAINE ISLAND ENTRANCE.—If intending to enter the Great Barrier reefs by Raine island, from lat. $15^{\circ} 30' S$., long 152° E., the direct course will be W. by N. $\frac{1}{4} N$. 510 miles to the island, passing 25 miles north-eastward of the doubtful position of the Diana bank, and 50 miles north-eastward of Osprey reef.

* See Admiralty charts: Australia, general chart, northern portion, No. 2,759a; scale, $d = 1.0$ inch; Pacific ocean, south-west sheet, No. 780; scale, $d = 0.75$ inch; Coral sea, sheets 1 and 2, Great Barrier reefs, Outer route and Torres strait, Nos. 2,763 and 2,764; scale, $m = 0.04$ of an inch; and Admiralty plans of islets and reefs in the Coral sea, No. 349; scale, $m = 1$ inch.

Captain Denham experienced little or no current in the fairway of the Outer route ; but due allowance should be made for a north-westerly set, when within 10 miles of the Great Barrier reefs.

In making the channels through the Great Barrier reefs, a great and sensible difference is experienced in the strength of the tide streams at springs and neaps ; and as many vessels have been wrecked on the barrier during the night, it should be considered an object of vital importance to make the Great Barrier reefs early in the daytime ; for it being generally high water on those reefs at about 9 o'clock at full and change, a vessel within 20 or 30 miles of the barrier at that time, would in addition to the north-west current, have a flood stream of 2 or 3 knots setting her, during a great part of the night, obliquely towards the reefs, and it is thus, it may be conceived, that so many vessels have been unexpectedly close up with the edge of the barrier at night, and nearly lost in consequence.

To avoid so fatal an accident as getting on, or near, the Great Barrier reefs at night (an accident which has always been attended with the total loss of the vessel, and in many cases, of the lives of those on board), when within 40 or 50 miles of the reefs, and night coming on, a vessel should be hauled to the wind, and all convenient sail carried on the starboard tack, or else short boards should be made every two hours, if the trade wind hang much from the eastward, to stem the current as much as possible, when, if a vessel be at all weatherly, it may be anticipated that 2 knots per hour will be the extreme amount that she will be set to the northward during the time of her standing off. If the night be clear, and the vessel in the hands of a careful navigator, stars should be observed to rectify the latitude ; then at daylight all sail should be made, and a course shaped for the entrance it is intended to run in by, making full allowance for the north-westerly set in steering towards the passage aimed at.

Even in the daytime, especially with light winds, the Great Barrier reefs must be approached with much caution, as a heavy swell almost invariably rolls in, and breaks with fearful violence upon the reefs, rendering it next to impossible for a vessel to beat off against a flood stream, in the event of her not finding an opening to run through.

Having made an opening, it should be taken under commanding sail, the vessel being piloted or guided from aloft ; anchorage will always be found within the barrier, the water being smooth and the depth varying from 15 to 25 fathoms, on a coral bottom.

Having fairly entered within the Great Barrier reefs, a vigilant look-out from aloft is requisite in proceeding towards Torres strait, as there are innumerable shoals scattered between the barrier and the mainland.

It has been already remarked that there is a great change in the appearance of the reefs at various times of tide ; but as anchorage will be found

nearly anywhere within the Great Barrier reefs, a vessel may anchor, if in perplexity, or if her route becomes indistinct from darkness, fog, or the glare of the sun.

ANCHORING.—As a general rule, vessels may anchor under the lee of most of the reefs and islands within the barrier during the prevalence of the south-east trade winds (from March to September); but it is not always safe to do so at the other seasons of the year, as heavy gales often come on to blow suddenly from the opposite quarter, when the north-west sides of those reefs and islands would naturally become dangerous lee shores.

H.M.S. *Fly*, during the survey, seldom experienced the slightest difficulty in weighing her anchor; but her tender, the *Bramble*, and especially the boats, suffered much in this respect; this can only be accounted for from the ground tackle of the former being sufficiently ponderous to break off the projecting irregular masses of coral, which the gear of the smaller vessels failed to do.

DIRECTIONS for RAINE ISLAND ENTRANCE and BLACKWOOD CHANNEL.—It being presumed that Raine island entrance, described at pages 316, 420, has been decided upon for passing through the Great Barrier reefs from the Outer route, and that the beacon on Raine island has been plainly made out, steer for the southern passage, which is much wider and far preferable to the northern. Entering the southern passage, the beacon must not be approached nearer than $1\frac{1}{4}$ miles, to clear the reef extending south-east of it; when the beacon bears North, a vessel should as soon as possible, bring the beacon to bear N.E. $\frac{1}{4}$ E., steering S.W. $\frac{1}{4}$ W. (allowing for tide and a northerly set) for Sir Charles Hardy islands. As soon as the beacon is lost sight of, the vessel will be clear of the shoal patches westward of the 100-fathoms line of soundings, and on the bank. Look out now for Sir Charles Hardy islands, and when they are plainly seen, bring their south extreme to bear S.W. $\frac{1}{4}$ W. and steer for it; when the easternmost sand-bank on the Middle bank bears N.W. by W., and the west Ashmore bank (if seen) S.S.W. $\frac{1}{4}$ W., the vessel will be well to the south-west of the Salamander patch, and a course may then be shaped for either the North or Pollard channels.*

Northern Passage.—Should a vessel be compelled to enter by the northern passage, she should steer so as to pass at about half a mile or two-thirds of a mile from the north side of Raine island; when clear of the island haul to the south-westward and bring the beacon to bear N.E. $\frac{1}{4}$ E.

* See Admiralty chart of Australia, east coast, sheet xx., No. 2,354; scale, $\pi = 0.25$ of an inch.

as quickly as possible, then proceed as before. Great care is here necessary to make the allowance for the stream and northerly set.

The seaman must not be alarmed by the cross and troubled sea, which, just upon the edge of the bank of soundings, is produced by a strong easterly wind acting against the ebb stream. The strength of the ebb stream in the vicinity of the Great Barrier reefs is, however, generally much less than the flood stream, which co-operates with the set to the northward, along the edge of the barrier, this set being caused by a long continued south-east trade wind; and for this full allowance must be made, not only when trying to make Raine island entrances, but when passing through them, in order to prevent being swept to the northward, among coral patches that have not been examined.

If Raine island passage should have been entered late in the afternoon, it would be prudent to anchor abreast, and well to the southward of the Middle banks, in 12 or 15 fathoms, by which the eastern sun of the following morning would enable the mast-head man to clearly discover all the dangers lying in the track to the westward; to be prepared for which a prudent seaman will have his vessel under moderate but commanding sail, with an anchor ready to drop, at a moment's notice, the whole way from the outer barrier to the mainland.

Although, as before noticed, there is a passage to the northward of the Middle banks, the patches which lie 2 or 3 miles to the northward, and the reported Tynemouth bank to the westward of them, render it unadvisable for a vessel to pass that way; if therefore the voyage be lengthened a few miles, it will be far better to make sure of passing to the southward of the Salamander patch and Middle banks, thereby escaping all danger, and having the advantage of seeing Ashmore banks, which are visible in clear weather, at a distance of 3 or 4 miles, and Sir Charles Hardy islands, at a distance of about 14 miles.

Should Raine island have been passed early in the morning, and the Middle banks reached by noon, the North channel will afford the shortest run to the Bird islands, under the lee of which a vessel may anchor if necessary. In taking this passage a vessel must, from about $1\frac{1}{2}$ miles South of the western Middle bank steer W. $\frac{1}{4}$ S. about 9 miles, allowing for the stream, and keeping a good look-out for the 3-fathoms patch on the south-west extreme of the Middle bank, and Tynemouth bank, pass three-quarters of a mile northward of the eastern point of Cockburn reef, and from thence proceeding through the North channel for the Inner route, as directed at page 288.

If, when abreast of Middle banks, circumstances render it expedient for a vessel to go through Pollard channel, she will find it safe, though narrow. The eastern extreme of Cockburn reef must be carefully made

out, and then the directions given at page 288 are to be followed for clearing Pollard channel.

Vessels after entering the Great Barrier reefs by Stead passage, or by either of the openings between it and the parallel of $12^{\circ} 30' S.$, are recommended to steer for Ashmore banks, and then proceed for North channel or Pollard channel, according to circumstances. It may perhaps be found convenient to proceed from these banks by the open channel to the southward of Sir Charles Hardy isles; but as that channel has not been closely sounded, it must be adopted with caution.

Although Raine island entrance is to be preferred on account of the beacon and the greater breadth of the opening, it by no means follows that Stead passage and the other practicable channels between it and lat. $12^{\circ} 30' S.$, are to be condemned. On the contrary, in the event of a vessel making the Great Barrier reefs, and either of these openings is distinctly recognised, it will be far better to take advantage of it than to attempt to beat out again for the sake of running through Raine island entrance, more especially if the vessel happens to find herself near an opening in Wreck bay, or any other deep indentation of the barrier, out of which it is next to impossible for a sailing vessel to beat against the heavy sea, which generally rolls in upon the reefs.

OPENINGS between LAT. $12^{\circ} 30' S.$ and RAINE ISLAND.—These channels being similar in breadth and character, directions for one will do for all; and although they do not generally average more than one-third of a mile in width, the Great Barrier reefs are here so narrow, that the run from the heavy sea outside, to the smooth water within the reefs is, with a commanding breeze, accomplished in a few minutes.*

When either of these openings is recognised beyond a doubt, steer boldly for it, conning the vessel from the mast-head, from whence, if the sun's glare be not ahead, all dangers lying in the channel will be easily distinguished by the colour of the water. The vessel having fairly entered, may first steer for Ashmore banks, and then proceed for North channel, or Pollard channel, as directed at page 288; or if late in the day, anchor inside the reefs.

PANDORA ENTRANCE.—This opening is only recommended as a sort of refuge entrance for a vessel to run for, in the event of her having overrun Raine island entrance, and being unable to beat back in time to enter that opening before dark.

Pandora entrance may be easily known by the large sand-bank on its southern side; round this, at the distance of about half a mile, and then

* See Admiralty chart of Australia, east coast, sheet xix., No. 2,353; scale, $m = 0.25$ of an inch.

bring it to bear N.E., and run through the inner side of the barrier with the sand-bank on that bearing, the depth will then be from 13 to 20 fathoms, when a vessel may anchor under the lee of the reefs; or if not late in the day, proceed to the north-westward, as directed at page 321.

If through thick weather or other unfavourable circumstances, a vessel should be so much out in her reckoning as to miss Pandora entrance also, the Papuan or Great North-east channel, is the only opening to leeward recommended, although a vessel may pass through Olinda, or Yule entrance if hard pressed, or even through one of the gaps farther to the northward. In running to the northward for the Great North-east channel, steer nearly parallel with the Great Barrier reefs, and at such distance from them as circumstances may render necessary. As this route is little known, much is left to the discretion and vigilance of the navigator, especially when passing between the barrier and the outer chain of reefs, which lie to the south-eastward of Murray island, and contract the channel to about 20 miles in width. Having passed these reefs and reached the parallel of $9^{\circ} 5' S.$ bear up to the westward for Bligh entrance and proceed as directed at page 383.*

GREAT NORTH-EAST CHANNEL.—The advantages of the Great North-east channel having been already noticed at page 381, it is here only necessary to remark that Captain Denham's traverses across the northern part of the Outer route appear to remove all doubts as to following the tracks on the chart, from lat. $15^{\circ} 30' S.$, long. $152^{\circ} E.$, to the entrance of the Great North-east channel; the only known dangers near the route being Coutance reef, with the north-west end in lat. $10^{\circ} 28' S.$, long. $147^{\circ} 28' E.$ (approx.), page 495, on the north-east side; and the Eastern fields and Portlock reefs on the south-west side.†

Although the route round the Eastern fields and through Bligh entrance to Booby island exceeds by about 90 miles that through Raine island entrance, the difference in distance is more than compensated for by the saving of time and relief from anxiety; for the Great North-east channel being broad and easy to make, with regular soundings and few hidden dangers, a vessel, properly managed, may run through Torres strait, from Bligh entrance to Booby island, without being compelled to anchor more than once; but entering the Great Barrier reefs by Raine island, is necessarily attended with much more risk and anxiety; and the intricate nature of a great portion of the route through Torres strait, although greatly lessened by beacons being placed on the most dangerous reefs, render it

* See Admiralty chart, Torres strait, sheet 2, No. 2,422; scale, $m = 0.25$ of an inch.

† See Admiralty charts: Coral sea, sheets 1 and 2, Great Barrier reefs, Outer route, and Torres strait, Nos. 2,763 and 2,764; scale, $m = 0.04$ of an inch; and Admiralty plans of islets and reefs in the Coral sea, No. 349; scale, $m = 1$ inch; also Admiralty chart of Torres strait, sheet 2, No. 2,422; scale, $m = 0.25$ of an inch.

necessary to anchor at least twice between the Great Barrier reefs and Booby island.

A vessel by the Outer route intending to proceed through Torres strait by the Great North-east channel, having arrived at a position in about lat. $15^{\circ} 30'$ S., long. 152° E., should steer N.W. $\frac{1}{4}$ W. westerly 550 miles to lat. $9^{\circ} 5'$ S., long. $145^{\circ} 20'$ E. This course will lead about 28 miles south-westward of Coutance reef, 24 miles north-eastward of the Eastern fields, and 35 miles north-eastward of Portlock reefs. The vessel should carry no more sail at night than she will conveniently bear if suddenly hauled to the wind; and every precaution should be taken against unknown dangers, which in this comparatively little-known region may still possibly exist.

From lat. $9^{\circ} 5'$ S., long. $145^{\circ} 20'$ E. steer W. $\frac{1}{4}$ S. for Bligh entrance, and proceed as directed at page 383.

CAUTION.—It need hardly be repeated that a vigilant look-out from the mast-head in the daytime, is absolutely necessary; at night, if the weather be not very boisterous, the ear may often detect the sound of breakers before they become visible. An anchor should always be kept ready to let go, and a vessel having entered the Great Barrier reefs should be kept under easy but commanding sail, with a boat in readiness to sound ahead, on the appearance of discoloured water, which will be often found to arise from the shadow of passing clouds, tide rippings in the vicinity of reefs, or from some cause not yet understood, in the spots of discoloured water, which have been so frequently met with and sounded over without showing any difference in the depth of water from that surrounding them.

It must be recollected that there are few familiar objects on the vast extent of the Great Barrier reefs to point out the position of a vessel, and however minutely the outline and geographical details of the reefs and shoals in these seas may be given to the navigator, they will avail him but little, unless vigilance and due caution be observed; for charts of coral waters, even on the highest authority, must not lull him into a fancied security, as until every foot of ground has been thoroughly examined, it would be wrong to suppose that numerous shoals and small heads of coral do not exist, which have hitherto escaped detection.

Sounding.—Although the lead should be constantly kept going whilst in soundings, it must not always be depended upon as indicating approach to reefs, as they generally spring up precipitously from the bottom, the lead often not giving sufficient warning to avoid them.

Glare of the Sun.—Steering directly with the sun in the vessel's course must be particularly avoided in the vicinity of reefs, as from the strong glare, it is then scarcely possible to discover dangers in time to steer clear of them.

FROM TORRES STRAIT TO SYDNEY BY THE OUTER ROUTE.

This passage appears not to have been often made, and like that from Torres strait to Sydney by the Inner route, was formerly considered only practicable in the north-west monsoon,—from November to February or March.*

The first object after clearing Torres strait, in the north-west monsoon, will be to take advantage of westerly winds for making easting, looking upon immediate progress to the southward as of secondary importance.

The schooner *Heroine*, which appears to have been the first vessel that ever succeeded in making the passage from Torres strait to Sydney by the Outer route, cleared the strait by Raine island in January 1845, and appears to have been favoured with westerly winds as far as lat. $14^{\circ} 40' S.$, long. $153^{\circ} E.$, when probably meeting with the south-east trade, she hauled up to the southward, but experienced some delay in clearing Lihou reef, and the south-east extreme of the Great Barrier reefs.

The ship *Caldew* took her departure from Booby island for Sydney by the Outer route, on the 6th of February 1852, with a fine breeze from the westward, and proceeded eastward by the Great North-east channel; having anchored but twice in her passage through Torres strait.

After clearing Portlock reefs, she gradually hauled to the southward, the wind still continuing fresh from the westward, until in lat. $14^{\circ} 55' S.$, long. $152^{\circ} 40' E.$, when it ceased at about 22 miles to the south-westward of where the *Heroine* lost it. The *Caldew* here experienced light breezes from the southward and eastward, with fine weather, and like the *Heroine*, hauled to the southward, but not being able to weather the outer edge of the Great Barrier reefs, narrowly escaped being wrecked on the reefs.

H.M.S. *Bramble*, on her passage from the Louisiade archipelago to Sydney in January 1850, from a position in lat. $15^{\circ} S.$, long. $155^{\circ} E.$ (115 miles to the eastward of where the *Heroine* hauled to the southward), made a good run for Sydney, passing the easternmost extreme of the Great Barrier reefs at the distance of 60 miles, and 30 miles to the eastward of Sandy cape.

Had the *Heroine* and *Caldew* made 100 or 120 miles more easting, before hauling to the southward, when they met the south-east trade, they would

* See Admiralty charts: Australia, general chart, southern portion, No. 2,759 b; scale $d = 1.0$ inch; Pacific, south-west sheet, No. 780; scale, $d = 0.66$ inch; Torres strait, sheet 2, north-east and east entrances, No. 2,422; scale, $m = 0.25$ of an inch; Cora. sea, sheets 1 and 2, Great Barrier reefs, Outer route, and Torres strait, Nos. 2,763 and 2,764; scale, $m = 0.04$ of an inch; and Admiralty plans of islets and reefs in the Coral sea, No. 349; scale, $m = 1$ inch.

doubtless have made a much better passage, and although they would have gone to the eastward of the frequented route, they would have avoided the apparently still more dangerous ground in the vicinity of the south-eastern limits of the Great Barrier reefs.

H.M.S. *Herald* made the passage from Raine island to Sydney, in the months of April and May 1860, in six weeks, having first worked against the full force of the south-east trade wind to Mellish reef. From thence, after crossing the Outer route, she cleared the dangers of the Coral sea, by passing between Saumarez and Swain reefs; the wind having inclined too far to the southward to admit of her weathering Kenn and Saumarez reefs.

DIRECTIONS.—In starting to the eastward from Prince of Wales channel or cape York in the north-west monsoon, a vessel may proceed by Raine island entrance, following inversely the directions already given for proceeding to the north-westward, or by the Great North-east channel. And having cleared the Great Barrier reefs or Eastern fields, as the case may be, take every advantage of westerly breezes, and endeavour to reach a position in about lat. 15° S., long. 156° E., going as much as practicable over the frequented route shown on the chart, and keeping an especial look-out when proceeding eastward of the route, into the unexplored space northward of Mellish reef.

Having attained the meridian of 156° , the vessel will probably be far enough to the eastward to take advantage of the south-east trade, and by hauling on a wind on the port tack might fetch Mellish reef, from whence, —especially if the beacon on it be still in existence—the vessel may easily take a fresh departure for Sandy cape, passing, if the wind permit, between Kenn and Wreck reefs on the east side, and Frederick and Saumarez reefs on the west side.

Should there be too much southing in the prevailing south-east trade wind to weather Frederick reef, the vessel may pass to the westward of it, and between Saumarez and Swain reefs; when a southerly current will probably enable her to weather Sandy cape, care being taken to avoid Break-sea spit, and the shoal near its eastern edge.

As a rule a vessel should be so sailed as to close the intermediate passage reefs in the daytime, to take a fresh departure, as the current between Saumarez and Swain reefs, may otherwise seriously affect the vessel's reckoning.

From Sandy cape proceed for Sydney by keeping the mainland in sight, when necessary, to take advantage of the southerly current, as directed for the passage from Torres strait by the Inner route, at page 404.

ROUTES BETWEEN AUSTRALIA AND CHINA.*

During the years 1869-1873, four different routes were taken by ships bound from the province of New South Wales to China; three of these routes are to the eastward of New Guinea, and one (the well-known Torres strait route) passes to the westward of that great island.

These routes are herein styled respectively, the Eastern, the Middle, the Western, and Torres strait routes.†

EASTERN ROUTE.—This route follows a line from Newcastle or Sydney to Norfolk island, thence to Matthew island, and north along the 171st meridian to 11° S., then N.N.W. to Pleasant island, crossing the Equator in 166° E., and through the eastern part of the Caroline islands to the ship's destination. This route is: from Newcastle to Hongkong, 6,150 miles; to Shanghai, 6,000; to Yokohama, 5,500.

Ten vessels have adopted the Eastern route, their average passage being 64 days; the shortest passage, 49 days, was made in the *Zenobia*, which ship left Newcastle, April 2nd; the longest passage, 74 days, was made by the *Windhorn*, which ship left Newcastle, December 21st.‡

MIDDLE ROUTE.—This route is from Newcastle or Sydney midway between Lord Howe island and the Elizabeth reef, thence northward to the channel, 200 miles in width, between D'Entrecasteaux reefs on the east, and Bellona, Chesterfield, and Bampton reefs on the west,§ thence between the Solomon and Santa Cruz islands to the Equator, which is crossed in 159° E.; proceeding through the middle of the Caroline islands, whence a course may be shaped for the destined port. The length of this route is: from Newcastle to Hong-kong, 5,500 miles; to Shanghai, 5,400; to Yokohama, 4,900.

* Derived chiefly from an analysis by Captain Allen, Harbour Master at Newcastle, of the logs of various sailing vessels that made passages during the years 1869-1873, and collected by Staff Commander T. H. Tizard, H.M.S. *Challenger*, 1874. Originally published in Hydrographic Notice No. 7, dated 9th March 1875.

† See Admiralty charts: Indian ocean, general, No. 2,483; Pacific ocean, general, No. 2,683; Pacific, S.W. sheet, No. 780; Pacific, N.W. sheet, No. 781; Pacific, sheet 9, No. 2,467; Pacific, sheet 10, No. 2,468; Pacific, sheet 1, No. 2,459; Australia, general, No. 2,759 *a* and *b*; Eastern archipelago, western portion, No. 941 *a* and *b*; Eastern archipelago, eastern portion, No. 942 *a* and *b*; Philippine islands, Molucca passage to Manilla, No. 943; China sea, southern portion, No. 2,660 *a* and *b*; China sea, northern portion, No. 2,661 *a* and *b*; Hongkong to Liau-tung gulf, No. 1,262; and Nipon island, No. 2,347.

‡ H.M. steam troop-ship *Adventure* made the passage by the eastern route, from Sydney to Hongkong, in 45 days, during the months of November and December 1874.

§ Possibly a series of reefs similar to Fairway, Darling, and Nereus reefs, *see* page 441, may exist and form a sort of connexion between New Caledonia and D'Entrecasteaux reefs to the eastward, and Bampton, Chesterfield, and Bellona reefs to the westward. Great care is therefore necessary in passing through this channel.

Twenty-nine vessels have taken the Middle route, their average passage being 48 days, or 16 days less than that of the Eastern route. The quickest passage made was by the *Thermopylae*, which ship left Newcastle on February 10th, and arrived in Shanghai on March 10th, or in 28 days. The longest passage recorded is of 65 days, the same as the average passage by the Eastern route; this was made by the ship *E. J. Spence*, which left Newcastle in April.

WESTERN ROUTE.—This route from Newcastle is N.E. to the 157th meridian, and due north on that meridian between Kenn and Bellona reefs to the latitude of Pocklington reef in 11° S., thence either to the north-westward between New Ireland and the Solomon group, or to the northward through the Bougainville strait, between Bougainville and Choiseul islands, crossing the Equator in about 153° E.; from this position a straight course may be shaped for either Shanghai or Yokohama; but for Hongkong the course is through the western part of the Caroline islands, thence to the Balintang channel.

The length of this route is, from Newcastle to Hongkong, 5,000 miles; to Shanghai, 4,900; to Yokohama, 4,600.

Five sailing vessels and one steam vessel have used the western route, the steam vessel made the passage in 23 days to Shanghai. The average length of passage of the sailing vessels was 48 days, being the same as the Middle route; the shortest, 34 days, having been made in April by the *Enie*, and the longest, 75 days, in July by the *Helen Malcolm*. In the same month, however, another vessel, the *Woodlark*, made the passage in 39 days.

TORRES STRAIT ROUTE.—The fourth or Torres strait route is also from Newcastle, N.E. to the 157th meridian, then north on that meridian to the latitude of the Mellish reef, and N.W. for Bligh entrance to Torres strait. When through Torres strait the route is between the Tenimber and Arrou islands, and by the passage between Ceram and Bouro into the Molucca channel, then round the north-east end of Celebes island into the Celebes sea, through the Basilan channel into the Sulu sea, and through Mindoro strait into the China sea. The distance from Newcastle to Hongkong by this route is 5,300 miles, and it has been taken by only one ship, the "*England*," which made the passage in 41 days, in the month of July.

Summary.—A careful examination of the statistics of these voyages in conjunction with the Wind and Current charts for the Pacific, Atlantic, and Indian oceans, published by the Admiralty in 1872, lead to the following conclusions; it being observed that the data alone supplied by these voyages has been dealt with.

During the months of January, February, and March, the average

passage by the Eastern route was 62 days; the longest recorded being 66 days, and the shortest 57 days.

The average passage by the Middle route was 40 days; the longest recorded being 45 days, and the shortest 28 days.

It would appear, therefore, that the Middle route is the proper one for vessels leaving Australia in January, February, and March.

It is well known that from the prevalence of the westerly monsoon in Torres strait and to the eastward of New Guinea, neither the Western nor Torres strait routes are suitable during the first three months of the year.

During the months of April, May, and June only one passage was made by the Eastern route, viz., in April, the time occupied being 49 days.

The average passage by the Middle route was 57 days; the longest recorded being 65 days, and the shortest 49 days; whilst during the same three months two passages were made by the Western route, one in 34 days, the other in 38 days, or an average of 36 days. No passage is recorded in these months by the Torres strait route.

The Western route seems in this case to offer the greatest facilities for making the passage, for ships leaving Australia in April, May, or June.

During the months of July, August, and September two vessels took the Eastern route, each ship making the passage in 61 days. The average passage by the Middle route was 54 days; the longest recorded being 64 days, and the shortest 41 days. The average passage by the Western route was 55 days; the longest recorded being 75 days, and the shortest 39 days; whilst one passage was made by the Torres strait route in 41 days.

It appears certain that in these months a better passage will be made by following the Middle rather than the Eastern route to China, the question as to which is the most advantageous track rests therefore between the Torres strait, the Middle, and the Western routes.

If a ship leaving Australia can enter Torres strait before the end of August this route will be found the best to take; if, however, she cannot get through Torres strait by that time, she should adopt either the Western or the Middle route; probably the Western will be found the quicker if every means are taken to get north after crossing the Equator until the 10th parallel is reached; as the vessel which was 75 days on this voyage wasted a fortnight in trying to work to the westward against light N.W. winds when between the Equator and 5° N. latitude.

During the months of October, November, and December the average passage by the Eastern route was 67 days: the longest recorded being 74 days, and the shortest 60 days. The average passage by the Middle route was 44 days; the longest recorded being 49 days, and the shortest 39 days. No passage was made at this season of the year either by the Torres strait or Western routes.

Much depends on the sailing qualities of the vessel, but as a general rule, ships leaving Australia in the months of January, February, or March for China or Japan should adopt the Middle route, and may expect to make the passage in about 40 days. Leaving in April, May, or June they should adopt the Western route, and may expect to make the passage in about 35 days. Leaving in July, or early in August, they should, (if they can get through Torres strait before the end of August,) take that route, and may expect to make the passage in 40 days. Leaving in September, adopt either the Western or Middle route, and the passage may be made in 55 days; and, finally, ships leaving in October, November, and December should adopt the Middle route, and may expect to make the passage in about 44 days.

The passage to China, southward of Australia, is only practicable for sailing vessels during the months of December, January, and February, as easterly winds may be then expected. This route, however, is not recommended, even if not bound northward of Singapore, for during the months of November, December, January, February, and March northerly winds and southerly currents prevail in Sunda, Banka, Gaspar, and Carimata straits, and it is a tedious process endeavouring to get to the northward under such adverse circumstances. A vessel has been known to take 30 days from Sunda strait to Singapore, a distance of 500 miles.

Viewing the different tracks in regard to their freedom from danger there is little doubt that the Eastern route is the clearest. The Middle route, however, is nearly as free from difficulty as the Eastern.

The Western route is at present the least known; the passage, however, between the Solomon islands on the east and the Louisiade archipelago and New Ireland on the west, is wide, and apparently free from danger (with the exception of Pocklington reef), and in April, May, and June, during which months ships gain the greatest advantage by using it, the weather is fine; so that there seems nothing to deter vessels from taking this track, provided a good look-out is kept.

For steam vessels trading between New South Wales and China and Japan, the Western route appears to be the most suitable at all seasons of the year.

The Torres strait route, although not free from danger, may be navigated with facility by captains who have had experience amongst coral reefs, and are accustomed to conn their vessels from the mast-head, the latter a precaution absolutely necessary. When through Torres strait there are few dangers on the track to China, as although islands are in some cases doubtful in position, they are of sufficient height to insure being readily seen.

CHAPTER IX.

SOUTH-EAST COASTS OF NEW GUINEA.—TALBOT ISLAND
TO EAST CAPE.*

VARIATIONS IN 1879 :				
Talbot island	-	4° 40' E.		Hood point - 6° 5' E.
East cape	-	-	-	6° 44' E.

NEW GUINEA (or Papua), although a distinct country, will necessarily be noticed in connexion with the Australian continent;—as its southern shores, together with the Louisiade archipelago, border the approaches to Torres strait (through the Coral sea) from the Australian colonies, New Zealand, and the Pacific ocean. The description of the south, east, and north-east coasts of New Guinea, from Talbot island on the south to cape King William on the north side; and the Louisiade archipelago will, therefore, be proceeded with, after a few brief introductory remarks on the first discovery, and subsequent examinations of this extensive, but hitherto little known coast and chain of islands.†

The first navigator who saw these shores, appears to have been Luiz Vaez de Torres, in the Spanish frigate *La Almiranta*, coming from the eastward in August 1606. Torres, in lat. 11° 30' S., came upon what he calls the beginning of New Guinea, which, however, appears to have been a portion of what is now known as the Louisiade archipelago. Being unable to weather the easternmost point of land (cape Deliverance), he bore away westward along its southern shores to the strait which bears his name.‡

Of the north-east coast of New Guinea, the earliest discoverers appear to have been the Dutch navigators Lemaire and Schouten, who, in 1616 discovered and traced a considerable portion of the coast, towards the present cape D'Urville and the coast westward of it. Dampier, in 1700, also saw a portion of the coast in the same direction. The next addition to

* In this edition (1879), Chapters IX. and X. have been much improved, from the valuable remarks and surveys of Captain J. Moresby, Lieutenant L. S. Dawson, and Navigating-Lieutenant T. L. Mourilyan, H.M.S. *Basilisk*, 1873-4.

† See Admiralty chart: Coral sea and Great Barrier reefs of Australia, sheet 2 No. 2,764; scale, $m = 0.04$ of an inch.

‡ Burney's Chronological History of Voyages and Discoveries in the South sea or Pacific ocean. Vol. ii. (Appendix), p. 475.

our knowledge of the north-east coast was made by D'Entrecasteaux in 1792, when, in entering the group of islands now bearing his name, coast along the coast for some distance. D'Entrecasteaux in 1797, also examined a large portion of the coast, giving his name to the cape just mentioned.

M. de Brongniart, in 1798, with two vessels, *La Boussole* and *L'Espérance*, after the discovery of some detached reefs, about 150 miles off the east coast of Australia between the parallels of 15° 30' and 15° 45' S., coasted northward, and he made the north coast of New Guinea, he then worked to westward along this new land, as it was then thought to be, until he reached its eastern point to which the significant name of cape D'Entrecasteaux was given. The gulf of the Louisiade was the name given to the space thus traversed by these vessels.*

The next addition to our knowledge of these coasts was made in August 1791 by Captain Edwards, in H.M.S. *Pandora*, shortly before the wreck of that ship upon the Barrier reef of Australia, when returning from Tahiti with the mutineers of the *Bounty*. In the published narrative of that voyage the following brief account is given:—"On the 23d saw land, which we supposed to be the Louisiade, a cape bearing N.E. by E. We called it cape Rodney. Another contiguous to it was called cape Hood; and a mountain between them we named mount Clarence. After passing cape Hood the land appears lower, and to trend away N.W. forming a deep bay, and it may be doubtful whether it joins New Guinea or not."†

In the following year Captains Bligh and Portlock, in H.M. Ships *Providence* and *Assistant*, bringing bread-fruit plants from Tahiti to the West Indies, saw, on their way to Torres strait from the eastward, a portion of the south coast of New Guinea, extending about 80 miles to the westward and northward from cape Rodney.‡

The earliest and only knowledge (until Owen Stanley's survey of 1849-1850) of the north part of the Louisiade archipelago was obtained from the expedition under the command of Rear-Admiral Bruny D'Entrecasteaux, who, on the 11th of June 1793, with *La Recherche* and *L'Espérance* during his voyage in search of the unfortunate La Perouse, came in sight of Rossel island, and then passed Piron, Renard, St. Aignan, the Bouvouloir, and D'Entrecasteaux islands.§

* Voyage autour du Monde par la Frégate du Roi *La Boussole* et la Flûte *L'Etoile*, en 1790-91.

† Voyage round the World in H.M.S. *Pandora*, Captain Edwards, in 1790, 1791, and 1792, by George Hamilton, surgeon; p. 100.

‡ Flinder's Voyage to Terra Australis. Atlas, pl. 13.

§ Voyage de Bruny D'Entrecasteaux envoyé à la recherche de la Pérouse. Rédigé par M. de Rossel ancien Capitaine de Vaisseau. Tom. i., p. 405, et seq. See also Atlas.

In June 1793, Messrs. Bampton and Alt, in the English ships *Hormuzeer* and *Chesterfield*, got embayed on the south coast of New Guinea, in what is now called the gulf of Papua, and after in vain seeking a passage out to the N.E. were forced to abandon the attempt, and make their way westward through Torres strait, after the discovery of large portions of the land forming the north-west shores of this bay, extending from Bristow island northward and eastward, upwards of 120 miles.*

In 1804, M. Rault Coutance, commanding the French privateer *L'Adèle*, made several discoveries on the south coast of New Guinea, which were recorded by Freycinet, from the MS. journal of Coutance, in the history of Baudin's voyage.† A portion of this is unquestionably the land seen by Captain Bligh in 1792; but in addition, detached portions of the north-eastern shores of the Papua gulf were doubtless seen.

In 1840, Captain J. Dumont D'Urville, with the French corvettes *L'Astrolabe* and *La Zélée*, during his last voyage round the world, determined upon the exploration of the southern shores of the Louisiade archipelago and New Guinea. On the 23rd of May, the expedition (coming from the eastward) rounded cape Deliverance, and passed westward, outside the barrier reefs extending along southward of the Louisiade archipelago and some parts of the southern coast of New Guinea. On reaching the meridian of 147° East, Captain D'Urville shaped a course for Torres strait; having in seven days made a running survey extending over a space 450 miles in length, without anchoring, or scarcely communicating with any of the inhabitants.‡

Captain F. P. Blackwood, during his survey of the northern and eastern entrances of Torres strait, with H.M. Ships *Fly* and *Bramble*, spent two months in 1845, upon the south coast of New Guinea, 140 miles of which, including that part seen by Bampton and Alt in 1793, was surveyed as completely as the time and means would permit. Great mud-banks, extending from 10 to 20 miles out to sea prevented any near approach to the shore except by boats.

In the following year, farther additions to the survey of the south coast of New Guinea were made by Lieutenant C. B. Yule, while in command of H.M. Schooners *Bramble* and *Castlereagh*. His survey was commenced at cape Possession, in 8° 35' 40" S. and 146° 23' 30" E., and continued

* Flinders' Voyage to Terra Australis. Introduction, p. xxxi.

† Voyage de découvertes aux Terres Australes, exécuté sur les corvettes *Le Géographe*, *Le Naturalist*, et la goëlette *Le Casuarina*, pendant les années 1800-4, sous le commandement du Capitaine de Vaisseau N. Baudin. Navigation et Géographie, p. 462. Rédigé par M. Louis Freycinet. And Atlas, pl. 1.

‡ Voyage au Pole Sud et dans l'Océanie sur les corvettes *L'Astrolabe* et *La Zélée*, pendant les années 1837-40, sous le commandement de M. J. Dumont D'Urville Histoire du Voyage, tom. ix. p. 208-215.

westward and northward as far as cape Blackwood, where the *Fly's* work ended—a distance of nearly 150 miles.

In 1849–50, Captain Owen Stanley, with H.M.S. *Rattlesnake*, and schooner *Bramble*, Lieutenant Yule, surveyed the Louisiade archipelago and the south coast of New Guinea from Heath point to cape Possession, thus joining the spot where Lieutenant Yule's previous work ended.

In 1874, Lieutenant L. S. Dawson, R.N. Admiralty surveyor attached to H.M.S. *Basilisk*, Captain J. Moresby, examined and partially surveyed the D'Entrecasteaux islands and the coast of New Guinea from East cape to cape King William. That headland is the western limit of the north-east coast of New Guinea, which is described in this volume.

The description of the south-east coast of New Guinea, from Torres strait to its eastern termination at South-east cape, will commence at Talbot island.

The COAST.—Talbot Islands to Mowatta Village.—

This part of the south-east coast of New Guinea, surveyed by Navigating-Lieutenant E. R. Connor, R.N., in 1873, consists of an almost unbroken line of mangroves with thick scrub inshore. The coast line is fringed with a mud bank which dries from a half to $1\frac{1}{2}$ miles from the shore.

Vessels of 12 or 13 feet draught may navigate between Talbot islands and Mowatta village.

From Katau river the low mangrove coast continues to the E.N.E. about 11 miles, when it becomes thickly wooded abreast of Bristow island; from thence it trends to the northward and eastward forming a bight between Bristow and Bampton islands. This part of the coast has only been partially examined.*

Anchorage.—During the S.E. monsoon, anchorage may be obtained under the lee of Talbot or Boigoo, Mount Cornwallis, and Saibai islands. During the N.W. monsoon the whole coast is a weather shore.

TALBOT GROUP consists of one large and six small islands; Boigoo, the largest, situated in about lat. $9^{\circ} 20' S.$, long. $142^{\circ} 15' E.$, is 6 miles long East and West and 2 miles broad, low, swampy, and without fresh water when visited by Captain Moresby, H.M.S. *Basilisk* in the month of March 1873. There is a large patch of cultivated ground near the village on the north side of Boigoo island. There are also two fishing

* Opposite to Bristow island is a navigable river, half a mile across, supposed to be a branch of Fly river; a boat went 5 or 6 miles up, no village was seen, the entire country being a swamp. The river was swarming with crocodiles.—The Rev. W. W. Gill, London Missionary Society, 1872.

stations on the south side of the island. The other islands are covered with mangrove and scrub.*

A bank of mud and rock extends all round the islands, in some places drying off nearly 2 miles at low water.

Cussar River, about 3 miles North of Boigoo islands, is shallow and unnavigable.

TAUAN or MOUNT CORNWALLIS is a remarkable island lying about 13 miles S.E. by E. $\frac{1}{2}$ E. from Boigoo (Tulbot) island. It is nearly triangular in shape, each side being about $1\frac{1}{2}$ miles long.†

The summit is situated in lat. $9^{\circ} 25' 30''$ S., long. $142^{\circ} 32'$ E., and is 795 feet above the sea. There is a small native village on the north side, the inhabitants of which belong to the same tribe as those of Saibai island. The London Missionary Society have established themselves on the island.

Nearly 5 miles South of Tauan island is a small bank, which dries at low water; a patch of foul ground lies $1\frac{1}{2}$ miles westward of the bank.

Tides.—It is high water, full and change, at Tauan island about 11h. 30m.; springs rise 12 feet.

SAIBAI ISLAND, separated from Tauan island by a passage $2\frac{1}{2}$ miles wide, is 12 miles long East and West, and four miles broad. The island is low and swampy; a considerable portion of the north-west side is, however, under cultivation, and a village there contains about 100 inhabitants. The houses are of a superior kind and built on piles; those of the chiefs are ornamented with strings of skulls of New Guinea bushmen. There are also three fishing stations on the island, one at the south-west point, and the others at the east end of the island. The dugong is caught, and pigs and dogs are common.

Saibai island is skirted by a bank of mud, coral and stones, drying a considerable distance at both east and west ends of the island.

The two islands named Taupi Kauamag and Koekotal Kauamag, close on the north side of Saibai island, are mangrove swamps. There is a deep passage between them and Saibai. Taupi Kauamag island is remarkable as being the home of a large number of flying foxes.

Between Saibai island and the mainland is a channel from 2 to 4 miles wide, and having from 5 to 22 fathoms water in it; nearly one mile northward of the centre of the largest Kauamag island is a spot of 3 fathoms. The western end of the channel is, however, barred by a shoal of from $1\frac{1}{2}$ to 2 fathoms water; on the eastern side the passage is

* See Admiralty chart: Coral sea and Great Barrier reefs, No. 2,764; scale, $m = 0.04$ inch.

† See Admiralty chart: Torres strait, sheet 2, north-east and east entrances No. 2,422; scale, $m = 0.25$ inch.

narrowed by shoals on either side to only mile in width, and the approach to this is greatly obstructed by several dangerous reefs and rocks.

Kaua River, the mouth of which is situated about $6\frac{1}{2}$ miles N.N.W. $\frac{1}{2}$ W. from the east end of Saibai island, is like the Cussar very shallow. Alligators abound in both.

Mabudani Hill, situated at the mouth of Kaua river, is 192 feet high, and thickly wooded. This hill is the only elevation in the whole extent of coast between Talbot islands and Mowatta village.

Chaparal Kaua and **Maloo Kaua** are two small islands of mangrove and scrub, lying off the entrance of Kaua river.

KATAU RIVER, which has two mouths, formed by a densely wooded island at its entrance, is nearly 15 miles north-eastward of Kaua river, and has been explored to a distance of 6 miles from its entrance. Both banks are of mud and covered with thick scrub, with forests of coconut palms in its immediate vicinity. The water is fresh at half ebb. The London Missionary Society have teachers here.

BRISTOW ISLAND (*Bobo*), 11 or 12 miles in circumference, is low, covered with mangroves, and separated from the mainland of New Guinea by a shallow mud-flat, 2 or 3 miles broad, with a low islet in the centre: this flat dries at low water, admitting of no passage along the coast, except for canoes, or perhaps a vessel of light draught, at high water.

The space between Bampton and Bristow islands is a shallow flat, and between the latter island and the northern extreme of the Warrior reef, is a bight occupied by shoals and foul ground. These shallows being what may be considered a lee shore, during the greater part of a year, are dangerous to approach, on account of the heavy rollers which set in, and break with great violence.

BAMPTON ISLAND, which forms the western point of the gulf of Papua, is about $8\frac{1}{2}$ miles north-east of Bristow island, and is only separated from the low mainland of New Guinea by a narrow creek. It has not been closely examined, but it appeared to be a low, thickly wooded island from 10 to 12 miles in circumference, with trees attaining an elevation of 200 feet above the level of the sea—a height exceeding that of any other trees in the neighbourhood. A bank of rocks and sand extends nearly 4 miles in a S.S.E. direction from the south point of the island, upon which the sea breaks heavily during the south-east monsoon, as it also does upon the eastern edge of the Warrior reef. There was a native village on the north point of the island in 1845.*

* See Admiralty chart of Papua or New Guinea, sheet 3, Bampton island to Aird river, No. 2,423; scale, $m = 0.25$ inch.

The GULF of PAPUA is an indentation of the coast, extending 187 miles E. $\frac{1}{2}$ N. from Bampton island, to cape Suckling, and is about 80 miles in depth. The shores of this extensive bay are low, and with the exception of Aird hill, in lat. $7^{\circ} 27' 30''$ S., long. $144^{\circ} 21' 30''$ E. and the Albert mountains, nearly 90 miles farther to the eastward, the west and northern coasts present no objects of sufficient elevation to serve as marks for making the land from the southward; the lead will therefore afford the best signs of approaching the land, especially to the westward, where sand and mud-flats extend far out from the shore.

From Bampton point, the south extreme of Bampton island, to Aird river, N.E. by N. 90 miles from the point, not a single eminence, or scarcely a tree more elevated than its neighbours, could be seen above the level outline of this extensive and apparently half-drowned country. It is wooded to the water's edge, the tops of the trees in many parts ranging from 100 to 150 feet above the level of the sea.

The numerous fresh-water openings in this portion of the coast appear to be the delta of some vast river,* forming, by its deposits, a continuation of mud-flats and banks of hard, fine, black sand, their outer 3-fathoms edges extending from 3 to 21 miles from the shore, projecting farthest from the land at about midway between Bampton island and cape Blackwood.

Inhabitants.—The population of this great delta appeared to be immense, as villages were seen at every part visited; but it was found impossible to hold friendly communication with the inhabitants, in consequence of their implacable hostility. They were seen quite naked, and did not differ in appearance from the Darnley islanders. The canoes resembled, but were rather inferior to those of Torres strait.

The vegetation of this country is totally different from that of Australia; the cocoa-nut, breadfruit, plantain, sago, palm, and sugar-cane growing here in the greatest luxuriance, altogether indicating a rich soil. A few pigs, resembling the wild boar, were seen at one of the villages; but no other quadrupeds.

Soundings.—The 100-fathoms edge of the bank of soundings in the gulf of Papua has not been minutely traced, but, by the soundings which have been obtained, it appears to extend northward and eastward from Portlock reefs to 112 miles eastward of Bampton island, and 80 miles south-eastward of cape Blackwood, and from thence slightly curves to the E.N.E., reaching within about 20 miles south-westward of cape Possession.

* A reference to a chart of New Guinea will show that it is quite possible for this river to have a direct course of 350 miles.

The soundings on this bank are generally very regular; the shoalest part being on the western side, where the bottom is chiefly a fine hard black sand and mud, at 30 to 40 miles from the shore; farther to the southward and eastward, as the water deepens towards the edge of the bank, the bottom consists of coral sand. From cape Blackwood to cape Possession deeper water approaches the shore as the coast becomes more elevated.

The COAST.—From abreast Bampton island, (*see* pages 376, 471), a low alluvial and thickly wooded coast, with several villages near the shore, trends N. $\frac{1}{2}$ E. 17 miles to the south point of the entrance of Fly river, off which is a low woody island (*Mibu*), 11 miles in circumference, and separated from the shore by a narrow creek; Breakfast point, the eastern extreme of this island, lies N. $\frac{3}{4}$ E. 16 miles from Bampton point.

FLY RIVER is a broad opening in the low wooded country, immediately to the northward of the island just mentioned, and is 5 miles wide at its mouth, where the water was found to be fresh. The north side of the entrance and river is a low wooded shore, extending many miles up from 8 miles N.E. $\frac{1}{2}$ E. from Breakfast point, where it forms a broad point, the south-east end of Kiwai, a large island, which has several villages on it.*

In December 1875 Mr. Macfarlane, in the mission steamer *Ellangowan*, ascended the Fly river for a distance of 150 miles to Ellangowan island, and there anchored in 17 fathoms; the range of tide here was about 3 feet, and the flood stream almost reached this distance. For nearly the first 100 miles the river is very shallow, with several dangerous sand banks, causing the *Ellangowan* to get on shore many times, although only drawing between 5 and 6 feet water. At about this distance there is a group of small islands, through which it was difficult to find a passage, beyond this the river narrows and becomes more rapid and much deeper.

For about 100 miles from the entrance the shores of the river are thickly populated by warlike, intelligent-looking natives, who attacked the vessel on her way up, but were more friendly on her return. Beyond the above distance there appeared to be no inhabitants.

The discoveries of Mr. Macfarlane were soon followed, and at the latter end of May 1876, Signor Dr. Albertis, who had been a companion of Mr. Macfarlane in the *Ellangowan* the previous year, commenced the ascent of the river in a steam launch, the *Neva*, of 12 tons burden. On the 28th June he reached the mountainous country, the counterscarp of the high

* Captain Blackwood went a short distance up this river, but was obliged to return from the hostility of the numerous natives residing on its banks. Nine miles outside the mouth of the river, the water was nearly fresh at the last of the ebb.

central chain, called Charles Louis, at a point in lat. $5^{\circ} 30' S.$, long $141^{\circ} 30' E.$, a distance of about 500 miles from the entrance. Here the river was 25 to 30 yards wide and very shallow, preventing the launch, which only drew $3\frac{1}{2}$ to 4 feet of water, getting any farther. From the rapidity with which the height of the water rose and fell, according as the weather was rainy or dry, the source of the river could not have been far distant. As a means of entrance to the interior, the Fly river, which is perhaps the largest in New Guinea, is of great importance. The river flows through interminable forests, which for the greater part of the year are under water, and vast grassy plains which are most likely converted into lakes during the rainy season. About 40 miles above Ellangowan island there is a large confluent, probably the Alice river.

That there are other large streams yet to be discovered flowing into the delta of the Fly is probable, because the large mass of fresh water at its mouth, in every season, which extends from Waighi to Dibiri, filling deep channels of the united width of from 15 to 20 miles, the two tracts of the mainland of New Guinea which encloses the delta, the latter forming a true archipelago, comprising the islands of Mibu, Kiwai, Attack, and many other smaller ones north-west of Kiwai, cannot be derived from the Fly alone, which during the dry season has but a small amount of water in it near its source, and the Alice is reduced to the proportions of a shallow creek. But it is also not improbable that there may be some large river, yet to be discovered higher up, flowing into the channel formed by the islands of the Fairfax group.

The islands at the mouth of Fly river are very flat, and covered with, if not formed of a thick stratum of alluvial soil, and therefore very fertile. But neither the islands nor the low lands at the mouth of the river are suitable to the white man.

No hills above 300 or 400 feet high could be seen at this farthest point, but lower down the river, from the top of a hill 250 feet high, some very high mountains were seen, at an estimated distance of from 50 to 60 miles. Above 100 miles from the entrance of the river, as the *Ellangowan* found previously, natives were rarely seen, and they in almost every case deserted their houses or villages on the approach of the strange vessel.*

There are depths of 4 and 5 fathoms in the mouth of Fly river; but a bank with 3 feet on it, 7 miles eastward of Breakfast point, and extensive flats to the southward, prevent the river from being available for vessels of great draught; vessels not drawing more than 14 feet, could, however, safely enter, by taking the precaution of having a boat ahead, and carefully attending to the lead.

* See Vol. 21, No. 5, of Proceedings of the Royal Geographical Society, p. 459. Also Vol. 1., No. 1.—January 1879, New Monthly Series of the Proceedings.

The approach to the entrance from the eastward has not been sounded, a good channel may, therefore, exist in that direction; this is the more probable from there being a comparatively deep break in the edge of the bank to the south-eastward.

Tree Island, which is low and wooded, is 4 miles long and 2 miles broad; it lies close off the point, and there are villages on its northern end: near the southern point of the island is a high round tree, in lat. $8^{\circ} 41' S.$, long. $143^{\circ} 37' E.$

Tides.—Off the mouth of Fly river, the flood stream sets N.N.W. 2 knots, and the ebb S.S.E. $2\frac{1}{2}$ knots, at springs.

MIDGE ISLANDS, three in number, are low and wooded, the westernmost and largest, lying 10 miles to the northward of Tree island, and only a mile or two from the shore; they are situated on a sand, and mud-flat, extending to the south-eastward. Several villages were seen on these islands.

This part of the coast was indistinctly seen; but there appeared to be a clear opening between the Midge islands and the larger island to the southward, probably communicating with Fly river.

PRINCE RIVER.—From the Midge islands, the low monotonous coast trends 17 miles northward, to an opening about $1\frac{1}{2}$ miles wide at its entrance. This channel, which carries 3 fathoms, was traced 5 miles in a south-westerly direction, to a small island in the mouth of a creek branching to the southward; from thence it turns north-westward 3 or 4 miles, and is joined by another channel of about the same width, apparently communicating with the sea, at 8 miles to the north-eastward, thus forming an island between the two channels, $7\frac{1}{2}$ miles long, from N.E. to S.W., and 4 miles broad. The east extreme of this island lies in lat. $8^{\circ} 7' S.$, long. $143^{\circ} 42' 30'' E.$

These two channels must be entrances to a river of considerable size, as the water was very slightly brackish at half a mile within the mouth of the southern entrance, and quite fresh at 2 miles farther up.

The land on the south side of the southern channel, along which the tide swept strongest, and which has a depth of 3 fathoms close to, was low and uniform, consisting of dark, rich, tenacious clay, broken down by the water, so as to form a precipitous bank 3 or 4 feet above high water. This bank was fringed with a species of stemless palm, with leaves from 26 to 30 feet long, like the cocoa-nut tree, and large massive branches of drooping fruit, precisely like that of the pandanus candelabrum.* Behind the palms extended a dense, impenetrable jungle, in which some of the

* Believed to be the toddy palm of Java, and the sago palm of Kissa, according to the statement of a native of the latter place.

trees (many of which were 100 feet high) were chiefly a species of mangrove.

On the western shore, at one mile north-westward of the little island in the mouth of the creek, before alluded to, two large barn-like huts were seen, but no inhabitants.

The north shore of the northern channel is higher than the land before seen, it being about 20 feet above the river, with banks of clay and having few trees in the neighbourhood; several rills of fresh water were found running down from the background, through the high grass and rank vegetation.

On this shore, and at about 3 miles from the entrance, was a native village consisting of five huts, apparently long deserted; the only one not in a state of dilapidation, resembled a long barn, or haystack; it was about 80 feet long and 20 feet broad, raised from the ground upon four rows of posts about four feet high, with a roof forming a very obtuse angle. This building was divided by partitions into five apartments, opening into each other by doors with hinges. Entrance was obtained into the two end rooms from the gables, and the others from the sides. The floor and partitions were made of the exfoliations or peelings of the toddy palm, with the leaves of which the roof was thatched. There was either one or two fire-places in each room, the hearth being a thick layer of clay, over which was a small platform.

Immediately to the northward of the northern channel into Prince river is a third opening, 3 miles wide at its mouth. All these openings are barred across by sand, and mud-flats, and similar shallows front the coast between them and the Midge islands, running off midway to a point, with a line of breakers extending eastward 12 or 15 miles from the shore, southward of which are heavy rollers.

The COAST.—From the opening, just noticed, to the northward of Prince river, the low woody coast extends N.E. by E. 6 miles to Bell point, from whence it was indistinctly seen trending N.N.W. about 7 miles.

Jukes Point, the next part of the mainland examined, lies N.E. 15 miles from Bell point, and like it, is low and woody.

The space between Bell and Jukes points was not closely examined, but it appeared to be the estuary of one or more rivers, with two large islands off their entrances, which are barred across by extensive mud-flats, with 3 to 8 feet on them at low water. These islands, which are low and thickly wooded, are inhabited; and a village was also seen near the shore, at about 3 miles north-westward of Jukes point.

GEORGE RIVER, which flows into this estuary at about 7 miles north-westward of Jukes point, appeared to be a considerable stream, and

is probably one of the mouths of the Fly river, as the water was fresh at its entrance.

Risk Point, E. $\frac{1}{2}$ N. 13 miles from Jukes point, is the next part of the coast that has been closely examined; and although it is low, the tops of the trees on it are 130 feet high.

CAPE BLACKWOOD, the south point of which lies E.S.E. 13 miles from Risk point, and in lat. $7^{\circ} 52' S.$, long. $144^{\circ} 30' E.$ is the north-easternmost limit of Captain Blackwood's survey, and remarkable for being considerably higher than the neighbouring land, with high trees on its point.

AIRD RIVER flows into the sea by a broad estuary between Risk point and cape Blackwood; but a bar, on which were heavy rollers, extends across, the least depth on it being 3 feet, at about the middle of its outer edge, S.E. by E. 7 miles from Risk point.*

Within Risk point, the western shore of the estuary, after extending northward $2\frac{1}{2}$ miles, recedes to the westward about 3 miles, and then trends N.E. by N. 8 miles to the actual mouth of the river, where the water was fresh. The whole of this shore is low, and intersected by creeks. A native village was seen on the north side of Risk point.

From cape Blackwood the eastern shore of the estuary of Aird river for 6 miles north-westward to Ince point, was not closely examined; but from this point it was traced about N.W. by N. 7 miles, to an opening branching off into two arms, one running East and the other to the N.N.W. The shore from this opening extends N.W. 3 miles to the mouth of the river.

Entrance Island is low, wooded, and $3\frac{1}{2}$ miles long from North to South, and $1\frac{1}{2}$ miles broad. It lies in the mouth of the river, with a 2-fathoms channel, nearly half a mile wide, on its western side, and a broader, but more shallow one on its eastern side.

The estuary of Aird river has not been closely sounded, but it seemed to be full of shoals; the deepest water on the bar appeared to be close to Risk point, where the depth was 6 feet, afterwards increasing northward, to 4 and 5 fathoms, until shoals, extending southward from Entrance island, again reduced the depth to 6 feet; the water afterwards deepened close to the western side of the island. From the centre of the bar to the channel on the eastern side of Entrance island, there is a more regular line of soundings, but the channel itself had only 6 feet in it.

The general direction of Aird river is N.W. by N.; it was examined by Captain Blackwood for 20 miles above Risk point, and its average

* The description of this river has been chiefly gathered from the remarks of Mr. McGillivray, naturalist, and author of the voyage of H.M.S. *Rattlesnake*, who accompanied the surveying party.

breadth seldom found to exceed one quarter of a mile, with irregular soundings of one to 5 fathoms; the general course of the river is direct, with numerous creeks running off in every direction. The tide was found to cease 10 miles above Entrance island, where the water was described as fresh.

The banks and adjacent country are flat, scarcely above the level of the sea at high water, and covered with dense woods, growing on muddy ground. For the first 12 miles above Risk point mangroves abounded, but above that distance lofty forest trees, with jungle, covered the country.

No inhabitants were met with until the farthest point was reached, when a tribe of more than 100 was encountered, and an immense barn-shaped house was seen. The natives were so daring and hostile that they openly attacked the *Prince George** and the boats with which Captain Blackwood and his exploring party ascended the river, although the latter were well armed and quite prepared.

Aird Hill, the most elevated object seen within the limit of Captain Blackwood's survey, bore E. by N. $\frac{1}{4}$ N., distant 7 miles from his last station up Aird river. It is an isolated hill, rising abruptly from the level flat to a height of 1,200 feet, and will be found a useful mark on this otherwise monotonous coast.

At about N.N.E. 30 miles from Aird hill, two peaks of a lofty mountain range were faintly discerned, and by an approximate measurement estimated at 4,000 feet in height.

FLATS fronting the COAST.—From a narrow inlet, with depths of 5 and 6 fathoms, along the east side of the reef extending southward from Bampton island, the outer or 5-fathoms edge of the flats fronting the west coast of the gulf of Papua extends about 50 miles in a general N.E. by E. direction, to a spit of fine, hard, black sand with about $4\frac{3}{4}$ fathoms on it. Two broad openings intersect this edge of the flats, and appear to be the entrances of channels leading towards the mainland.

The first opening, which lies between 20 and 30 miles north-eastward from the spit of the reef stretching out from Bampton island, has shoals in the centre, with 6 and 7 fathoms on either side of them, and is apparently the entrance of a channel trending north-westward towards Tree island and Fly river; but it was not sufficiently examined to determine whether it is navigable or not. Between this opening and the south side of the entrance of Fly river is an extensive bank, with 3 to 9 feet water upon it, about 5 miles south-eastward of which is a small 3-foot knoll.

The second opening lies about 20 miles north-eastward from the former,

* A revenue cutter of about 70 tons, lent by the Colonial Government at Sydney, to serve as a tender to H.M.S. *Fly*.

and immediately to the south-westward of the spit of black sand, just mentioned ; the entrance is 8 miles wide, with depths of 7 to 12 fathoms. Two or three lines of soundings north-westward, in 5 to 7 fathoms, seemed to show a navigable channel in that direction, passing about 2 miles northward of the north-easternmost Midge island, where the depth was 6 fathoms at 6 miles from the mainland ; but farther progress towards the land was checked by heavy rollers.

From the spit forming the north-east side of this opening, the 5-fathoms edge of the flats trends northward and north-eastward, nearly following the indentation of the coast, and continues unbroken for 50 miles to abreast of cape Blackwood, from which it extends 6 miles.

With the exception of a long shallow spit stretching out eastward from a small islet and some rocks between Midge islands and Prince river, and an isolated bank, with $2\frac{1}{2}$ fathoms on it, S. $\frac{1}{2}$ W. 14 miles from Risk point, the depth of water over these extensive flats was generally found to be uniform, the soundings decreasing gradually from 4 fathoms near the edge, to about 3 feet near the shore, and the bottom consisting of fine black sand and mud.

DIRECTIONS.—On making the west coast of the gulf of Papua—after astronomical observations—the soundings and discoloured appearance of the water will prove the best indications of approaching the land, as its low flat aspect renders it invisible beyond 6 or 7 miles from a ship's deck ; the lead should therefore not be spared, and the first hard cast after mud, may be considered a certain sign of getting into shallow water. At night the edge of the flats should not be approached within a depth of 5 fathoms.

Caution.—During the height of the south-east monsoon this is a dangerous lee shore, with a heavy surf breaking upon it ; and in blowing weather the sea fairly breaks in 4 fathoms.

Should a vessel enter either of the numerous rivers on this coast for the purpose of watering, refitting, or trading with the natives, she ought to be well armed and prepared, against surprise.

Tides.—It is high water on the flats fronting the west coast of the gulf of Papua, full and change, at 10h. 30m. ; springs rise 14 feet, neaps 10 feet, and range 6, with a regular ebb and flow. The flood sets north-westward towards the rivers, and the ebb in the opposite direction, the former at a rate of 2 knots and the latter $2\frac{1}{2}$ knots at springs. The flood stream strikes the shore at right angles along all this part of the coast, and follows the same direction throughout. The ebb sweeps directly off shore, carrying the discoloured water to a distance of 30 or 35 miles.

DECEPTION BAY is an extensive bight in the low country, immediately to the eastward of cape Blackwood; it is 20 miles wide E.N.E. and W.S.W. between the cape and Bald head, and is 9 miles deep.*

This bay received its name from at first, presenting every appearance of a good deep entrance to some large navigable river, but after a very careful examination, no channel could be found through the shallows into either of the openings, which are evidently the mouths of some considerable river, as several large trees and trunks of the sago palm were seen drifting down.

The western shore of Deception bay from cape Blackwood, trends N. by W. 8 miles to an opening probably communicating with Aird river, and isolating that cape. From hence an irregular coast, intersected by broad openings, like mouths of rivers, forms the head of the bay. The broadest opening lies between Bald head and a point north-westward of it, on which is a village; the land on either side of this opening is somewhat higher than the adjacent country. A small islet, with some high trees on it, lies W.N.W. 3 miles from the village.

A deep inlet runs into the bay through the 5-fathoms edge of the flat at E. $\frac{3}{4}$ S. 15 miles from cape Blackwood, and extends 9 miles in a north-westerly direction; it is about 3 miles wide within the entrance, becoming more narrow towards the land, the depths varying from 6 to 8 fathoms, sand and mud.

Close to the eastward of this inlet, and S. $\frac{1}{2}$ W. 10 miles from Bald head, is a deeper channel with a wider entrance, reaching within 4 miles of Bald head; it has 14 fathoms at the entrance, the depth gradually decreasing to 5 fathoms towards the shore.

The remaining portion of Deception bay consists of shoals and intricate veins of deep water, the bottom being generally fine, hard, black sand. There are two small sand-banks, which dry at low water, one W.S.W., 8 miles, and the other S. by E. $\frac{1}{2}$ E. 6 miles from Bald head; and a shoal with $3\frac{1}{4}$ fathoms on it, lies $1\frac{1}{2}$ miles off the entrance of the western inlet bearing S.S.W. $12\frac{1}{2}$ miles from Bald head.

West Entrance Islet, which is small and woody, lies close off the mouth of an opening in the mainland, at 12 miles eastward of Bald head. The intermediate coast is low and intersected by openings, similar to those noticed to the westward, but not so broad. Here the 5-fathoms edge of the flats which skirt the coast, closes to within 4 miles of the shore.

* See Admiralty chart of Papua, sheet 4, Aird river to Freshwater bay, No. 2,120; scale, $m = 0.25$ of an inch.

East Entrance Islet is similar in size and aspect to that just described, from which it bears E. by S. $\frac{1}{4}$ S., distant $10\frac{1}{2}$ miles; it also lies in the entrance of an opening in the mainland. The coast between the two islands is low and woody, with a small opening 4 miles eastward of West Entrance islet.

The shore now becomes still more bold to approach, there being a depth of 5 fathoms within $2\frac{1}{2}$ miles of the islet.

MACLATCHIE POINT, E. by S. $\frac{1}{4}$ S. 17 miles from East Entrance islet, is a low projection of the mainland, with a large village on its western side. There is a creek 2 miles eastward of the islet, between which and the point the coast forms a bay, with a small coast-range at its eastern end; there is another village near the centre of the bay. The coast here, although it continues low, is more open; the two hills, of moderate height, at the back, together with the coast range at the east end of the bay, begin to break the monotony of this hitherto flat country.

Maclatchie point may be approached within 2 miles on its south-west side, but a 3-fathoms shoal, on which the sea breaks, lies $3\frac{1}{2}$ miles S. by E. $\frac{3}{4}$ E. of the point; there is, however, a 6-fathoms channel one mile wide, between this shoal and the shore.*

The COAST from Maclatchie point trends E. $\frac{1}{4}$ N. $17\frac{1}{2}$ miles to Pier point, a low projection of the mainland like a pier, and forming the southern side of apparently the entrance of a river, which had a very inviting appearance, until a close examination proved it to be, like all the others, blocked up by a bar. The intermediate coast line is more regular than that lately described, and amongst other indications of a difference in the aspect of the country is a cliffy bluff, with a ledge of rocks running out south-eastward from it. There are some isolated hills from 3 to 14 miles northward of the bluff, and a low coast-range extends 5 miles between the bluff and Pier point.

* Off this point H.M. schooners *Bramble* and *Castlereagh*, in 1846, fell in with a canoe of extraordinary dimensions and appearance. As nearly as could be estimated, it was about 60 feet long and 20 feet broad, and appeared to be a treble or quadruple canoe, with a platform covering nearly the whole: this platform was enclosed by bulwarks of cane 5 or 6 feet in height, which supported another platform or sort of upper deck. It had masts and two large sails, stretched between long poles, spread like the letter V; there were also several small square sails, some suspended like studding sails. Three men were steering with long paddles like oars over the stern. The number of the crew appeared to be between 40 and 50, most of whom were upon the upper platform, stringing their bows and preparing for a fight, when approached by a boat sent from the *Bramble* to get a nearer view of this singular vessel. This canoe was seen under sail one evening, and on the following morning, the weather being nearly calm.

CAPE CUPOLA, $3\frac{1}{2}$ miles south-eastward of Pier point, is a bold clifty head-land, surmounted by a remarkable dome-shaped hill of considerable height, a continuation of which descends to Pier point. From the cape a bold steep coast trends E.S.E. 4 miles, rising to hills from 200 to 300 feet high, and is succeeded by a lower and more wooded shore, backed by a range of moderate elevation, and extending E. $\frac{1}{2}$ S. 12 miles to some villages on a low point forming the northern side of the entrance of a river. This part of the coast appeared populous and fertile from the number of villages and cocoa-nut groves seen; it is bold of approach to the distance of 2 miles.

The mouth of the river is $2\frac{1}{2}$ miles wide from N.W. to S.E.; but a bar with four low woody islets on it, stretches across, leaving no navigable channel.

FRESHWATER BAY, into which the river just mentioned flows, was so named from the *Bramble* and *Castlereagh* having filled their tanks from the fresh water on the surface of the sea, where the vessels were at anchor, at about a mile outside the bar; the body of water running out of this river being so great as to be quite fresh, at least 2 or 3 miles off shore.*

For a vessel of weak force, in want of water, this will be found a very convenient place to get a supply; for although there is an abundance of fresh water along the southern coast of New Guinea, and at many of the large islands of the Louisiade archipelago, no watering party would be secure from the attacks of the natives on shore, without the protection of a strong armed force.

Albert Mountains.—The country to the northward of Freshwater bay is very hilly, the Albert mountains being a lofty range extending from 12 miles northward, to nearly 35 miles north-westward of the river; these mountains are visible at a distance of 60 miles, in clear weather.

The COAST.—From the mouth of the river in Freshwater bay, the general direction of the coast is S.E. $\frac{1}{2}$ S., and the distance 34 miles to cape Possession. For the first 20 miles the shore is low and woody, with several creeks intersecting it; but to the southward it becomes more bold, and is backed by a ridge of hills of considerable height, rising abruptly from the coast, which near the cape, consists of cliffs and valleys.

* The depth of the fresh water above the surface of the sea being but a few inches, it is necessary to remark that the water received by means of the wash-deck pump was found to be brackish, by the salt water being stirred up and mingled with the fresh; but it was procured in a perfectly pure state, by anchoring the boats a few yards from the vessels, and filling the casks overboard, by allowing the water at the surface to run in at the bung-holes.

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Nearly midway between Freshwater bay and cape Possession the coast recedes, and forms a shallow bay, about midway of which is a shoal, or the edge of a flat, with $3\frac{1}{2}$ fathoms, between 3 and 4 miles off shore, to the southward of which the depth suddenly increases to 8 fathoms. From Freshwater bay to 12 miles south-eastward of it, the coast may be approached to the distance of 2 miles; and between One Tree hill and cape Possession, a distance of 13 miles, it may be approached to the distance of half a mile.

This part of the coast is very populous, as several villages and extensive cocoa-nut groves were seen; as were also a number of large canoes full of people, near the shore, who were with great difficulty prevented from boarding the *Bramble* and *Castlereagh*.

CAPE POSSESSION, in lat. $8^{\circ} 35' 40''$ S., long. $146^{\circ} 23' 30''$ E., is a bold cliffy point, forming the southern termination of the steep coast range already mentioned; Clump hill, its highest part, is peaked and well defined, appearing from north-westward like an island, the land within it being low.

The water is deep within 2 miles of cape Possession, and quite free from dangers; but a heavy surf breaks upon it, as it does upon the whole coast between this cape and Bampton island.

The neighbourhood of the cape is very populous; but the inhabitants were apparently far more advanced towards civilization, and less hostile than those of the coasts to the westward. They were well made, active, and intelligent, varying in shades from nearly black to a light copper colour, and differed from all other men hitherto met with in this part of the world, as they had some regard to decency, having round their loins a sort of native cloth, similar to that made by the South Sea islanders. They chewed the betel-nut with chinam; but they evidently never had intercourse either with Malays or Europeans, as they possessed no iron, and were not even acquainted with its use.*

Tides.—The tide streams between capes Blackwood and Possession, from 10 to 20 miles from the shore, were found to set nearly East and West, in accordance with the general direction of the coast; the rate being between 2 and 3 knots.

* Lieutenant Yule landed at cape Possession in 1846 for the purpose of obtaining surveying observations; and after having taken possession of this newly discovered part of the country in Her Majesty's name, he attempted to re-embark, but the boat was upset in the surf; and being without the means of defence, he and his party were at the mercy of nearly 100 natives, armed with spears, clubs, stone axes, and other weapons; but after possessing themselves of everything within their reach, they suffered Lieutenant Yule and his party to escape by a boat veered through the surf for their rescue.

Owen Stanley Range.—Eastward of the gulf of Papua the south-eastern portion of New Guinea rises to lofty mountains, contrasting in a very striking manner with the low level country described to the westward. Of these mountains, Owen Stanley range, which may be termed the back-bone of this part of New Guinea, is almost a continuous chain, extending from about lat. $7^{\circ} 55' S.$, long. $146^{\circ} 20' E.$, nearly E.S.E. 330 miles, and terminating near East cape.*

Mount Yule, N.E. $\frac{1}{4}$ N. 31 miles from cape Possession, and in lat. $8^{\circ} 14' 30'' S.$, long. $146^{\circ} 46' E.$, is a very remarkable table-topped mountain, 10,046 feet high, and the crowning summit of a detached portion of Owen Stanley range, 30 miles from its north-western termination; the dividing gap in the range being a very deep valley, about 20 miles southward of mount Yule.†

The country between this mountain and the coast, already described, from Freshwater bay to cape Possession, is hilly, but apparently fertile.

The COAST from cape Possession trends S.E. $\frac{1}{4}$ S. $12\frac{1}{2}$ miles to Aoo point, a small woody hillock near the water's edge. For the first 9 miles the shore consists of a sandy beach, backed by a coast range of woody hills, with a strip of level land between, on which were seen several villages; and one continuous forest of cocoa-nut trees, extending for several miles along the back of the beach, at the base of the hills. From the termination of the beach to Aoo point the land is very little above the level of the sea, and covered with a dense jungle. The water is deep near the shore, there being 11 fathoms within 2 miles of it.

YULE ISLAND, close to the southward of Aoo point, is 4 miles long, N.W. by N. and S.E. by S., and $1\frac{1}{2}$ miles broad; it rises to several peaks, the highest of which, near the south-east end of the island, is 534 feet in height. The west shore, which may be approached within $1\frac{1}{2}$ miles, consists of rocky points and sandy beaches, fronted in the southern part by coral reefs extending one mile from the shore. The hills slope gently to the sea, and had a green and fertile appearance, being covered alternately with trees and grass.

Natives.—The natives of Yule island are numerous, of a dark copper colour, and quite a different race from the black Papuans of Torres strait. They crowded on board H.M.S. *Basilisk*, when anchored in Hall sound in 1873-4, and were friendly when their villages were visited. Their weapons consist of bows and arrows, spears and clubs.

* See Admiralty chart of Papua, sheet 5, Freshwater bay to Round head, No. 2,121; scale, $m = 0.25$ of an inch.

† Mount Yule was seen from the *Bramble's* deck on a clear day, at the distance of 117 miles.

There was no apparent trace of there having been before visited by white men, they being quite ignorant of the use of iron or fire arms, and prefer the polished Torres strait pearl shell to any other article of barter. The villages are all situated a short distance from the beach, in the bush, and out of sight. The plantations are very extensive, neatly fenced in, producing an abundant supply of yams, bananas, sweet potatoes, &c.

A Mission station has lately been established on the island.

HALL SOUND.—This large sheet of water lies inshore and to the eastward of Yule island. Between the north end of the island and the mainland there is no passage, but good anchorage sheltered from the south-east, was found by H.M.S. *Basilisk*, 1873, under the north point of Yule island in $6\frac{1}{2}$ fathoms.

The southern entrance has a good channel about three-quarters of a mile wide. But care must be taken to keep a mid-channel course, for extensive reefs extend from both the mainland and Yule island.

Mid-channel the *Basilisk* found an average depth of 13 fathoms leading into Hall sound, where sheltered anchorage under the lee of Yule island or elsewhere may be found, the lead giving ample warning of too near approach to the mud banks which occupy the northern and eastern sides of the sound. But warning by the lead is not given in approaching Yule island reef, the edge of which is patchy and dangerous. The channel is always discoloured by the quantity of fresh water escaping from Hall sound.

Ethel River discharges itself over an extensive mud flat into the north-east part of Hall sound.

At high-water it is probable a channel of 9 feet would be found. After entering the river a depth of 9 feet, with a slight current, and a width of about 120 yards was found.

Hilda River, a rapid powerful stream, running from the N.E. with too strong a current for a boat to stem for more than a short distance, falls into Ethel river $1\frac{1}{2}$ miles from the entrance of the latter.

Above the junction with Hilda river Ethel river assumes the character of a sluggish stream, from 80 to 100 yards in breadth and 12 feet deep, leading to the eastward through a dense fresh-water mangrove swamp. This river was examined for about 10 miles; a few native plantations and huts were found on its banks, but the river appears to be formed by the drainage of the swamp, and not to lead into the open country.

CAPE SUCKLING is a low woody projection S. by E. $\frac{1}{4}$ E. 10 miles from Yule island, the intermediate coast being of the same aspect and backed by ridges of hills between 700 and 800 feet high, extending from the opening southward of Yule island to 10 miles eastward of cape Suckling, at a distance of one to 3 miles in shore. The south-east portion

of this range consists of sand-hills covered with scrub, the two most conspicuous of which rise to the heights of 770 and 650 feet, and are visible at a distance of 30 miles; these two are the southernmost hills of the range, and form the only feature by which the cape may be recognized.

Drift Timber and Discoloured water.—Off the coast northward of cape Suckling, large quantities of drift wood are sometimes seen, which in the early morning may be mistaken for reefs; the sea also has a discoloured, muddy appearance.

The BARRIER REEF.—There is a coral shoal W. $\frac{3}{4}$ N. 8 miles from cape Suckling, with 8 fathoms upon it, which appears to be the north-westernmost extremity of a great barrier reef, extending along nearly all the coast of New Guinea, from cape Suckling to South cape, and along the southern and eastern sides of the Louisiade archipelago. This reef is somewhat similar to that off the east coast of Australia, but not so uniform in its elevation, some parts, here called the "sunken barrier," being only approximately traced by the difference of depth of water, and character of the bottom. This irregularity in the formation of the New Guinea barrier reef may probably be attributed to the immense bodies of fresh water which flow into the sea upon this coast, and which is well known to be destructive to the growth of coral: this hypothesis is strengthened from the fact that the Louisiade and Australian barrier reefs, which are generally beyond the influence of fresh water, rise almost without an exception, to the surface of the sea.

REDS CAR HEAD is a remarkable projection of the mainland S.E. $\frac{3}{4}$ E. 26 miles from cape Suckling, rising abruptly, like an island, from a low woody point; it is 565 feet high, and conspicuous from the cliffs which form its southern face, being red and white; the head is visible at the distance of 21 miles, and from the south-west makes like an island.

REDS CAR BAY.—From cape Suckling the coast trends S.E. by E. for $4\frac{1}{2}$ miles, it then recedes to the eastward and southward to Redscar head, forming between Redscar bay, which is about 20 miles wide, and 6 miles in depth; its shores are low, flat, and densely wooded, and are intersected by five openings, apparently the mouths of streams, the largest of which, $8\frac{1}{2}$ miles northward of Redscar head, lies near the head of the bay, named by the natives Towtou, is the outlet of the Lalokie and Goldie rivers. On the south side of this opening a Polynesian Mission station belonging to the London Missionary Society has been established. At W. $\frac{3}{4}$ N. 5 miles from Towtou opening are the Skittle rocks, conspicuous from seaward, from their standing higher than the low land behind them

A coral shoal, with 4 fathoms water on it, lies 2 miles off shore, near the north-west end of the bay, and W. $\frac{1}{2}$ N. 8 miles from the Skittle rocks. But with this exception the water appeared to shoal regularly to within 2 miles of the land, the soundings all over the bay ranging from 9 to 28 fathoms, on a muddy bottom.

A spit of foul ground runs out one quarter of a mile westward from Redscar head; and shoal water, about one mile wide, extends along the shore northward from the head to Manao river, a small opening 5 miles distant; a continuation of this shoal water probably skirts the other shore of the bay.

Anchorage.—H.M.S. *Basilisk* anchored in Redscar bay in a depth of 7 fathoms, mud, on the following bearings:—Skittle rocks N.W. $\frac{1}{2}$ N., Towtou opening N.E. by E. $\frac{1}{2}$ E., distant $3\frac{1}{2}$ miles. At $2\frac{1}{4}$ cables inside this position the bank shoaled rapidly to 4, 3, and 2 fathoms to the shore. On this bank, with the wind against the tide, there is a dangerous sea for a boat. This anchorage is more convenient than that under Redscar head for communicating with the Mission station at Towtou opening.

It is therefore recommended that a ship drawing more than 18 feet should not anchor in less than 8 or 9 fathoms, as a heavy sea gets up with a strong breeze.

Redscar bay is, during the south-east monsoon, a wild exposed anchorage.

Galley Reach, about 3 cables wide, in which there are from 5 to 8 fathoms, extends 6 or 7 miles from Towtou opening in a N.E. by N. direction, terminating in an extensive, densely wooded, mangrove swamp.

EDITH RIVER empties itself into Galley reach, at 4 miles from Towtou opening, and is, when above the influence of the tide, a very rapid winding stream, from 20 to 40 yards in width, with an average depth of 10 feet. This river was ascended about 10 miles, through low swampy ground; the country then changed to undulating spurs, but the rapidity of the current and the quantity of uprooted trees and snags, prevented a further advance.

USBORNE RIVER.—This river, which is a continuation of the Lalokie, *see* foot note, page 491, falls into Towtou opening, near the south point of the entrance, is 30 yards broad, with an average depth of 12 feet, for about 14 miles above the Mission, where the Lily river joins from the south-east. Above the confluence of Lily river the current is very rapid, a boat scarcely being able to stem it, and one mile further up, the whole course of the river is blocked by rafts of trees, forming vegetated islands, under which the river rushes violently. The country at this point was comparatively open, with small hills.

Four days were spent in examining these rivers without meeting a single

canoe, or a sign of natives anywhere. But at Towtou village the natives spoke of a very warlike tribe who lived some miles up one of the rivers.*

The Natives seen about Redscar bay are of a dark copper colour with bushy heads, and do not appear to be so numerous as to the southward. They have large single canoes with mat sails, and their arms are long spears, and bows and arrows. They barter cocoa-nuts, yams, sugar-cane, and plantains, for iron hoops, &c., and appear to be a friendly intelligent people. No signs of cannibalism were visible. None of their villages are seen from the sea, being placed in the bush in cleared spaces.

Pariwara Islets are small and two in number, with some rocks, lying from $1\frac{1}{2}$ to 2 miles north-westward of Redscar head, the largest island is 234 feet high; they have growing on them a few pandanus trees and some long grass; a sandy spit runs out from the north-east extreme, and shoal water extends a quarter of a mile from the south-west end of the larger islet. Between these islets and the shore the water is clear, with a depth ranging from 9 to 15 fathoms.

H.M.S. *Rattlesnake* anchored in 13 fathoms, mud, at one mile south-eastward of the larger islet, in the north-west monsoon; but the anchorage was not then a good one, it being exposed to the swell. In fine weather, a vessel may anchor in any part of Redscar bay, and the holding ground is good, but it does not afford protection from the swell of either monsoon.

REDS CAR HILL, E.N.E., $2\frac{1}{2}$ miles from Redscar head, is isolated, and rises abruptly from the low land to the height of 575 feet; when made from the southward it appears quoin shaped, but when made from the northward and westward the hill appears more rounded.

CAUTION BAY, studded with dangerous reefs and outlying patches, and fronted in the south part by Cliff and Aplin islands, lies between Redscar head and a conspicuous red bluff cliff, bearing S.E. $\frac{3}{4}$ E. $9\frac{1}{4}$ miles of it. The soundings are irregular, varying from 15 fathoms to $3\frac{1}{2}$ fathoms, without any apparent change in the colour of the water, but a safe channel from Redscar head to the eastward, inside the Barrier reef, may be found by following the sweep of Caution bay at a distance of about 2 miles from the shore, and passing within half a mile of Red cliff; on this passage the least water obtained by the *Basilisk* was 4 fathoms.

Aplin Island, S. $\frac{1}{2}$ W., $8\frac{1}{2}$ miles from Redscar head, is low, uninhabited, and covered with scrub; it is situated on the north-west extremity of the first perfect part of the barrier reef seen off this coast from the westward. At 3 miles eastward of it is Cliff islet, with a small sandbank on its north-west side, upon the inner or north edge of the barrier reef.

* H.M.S. *Basilisk*, 1873.

Close outside Aplin isle no bottom could be reached with 100 fathoms, but there is very good anchorage in 14 fathoms, at half a mile north-eastward of the island with smooth water in the south-east monsoon. Strong tide ripples were experienced 3 miles northward of the island.

CAUTION.—A dangerous coral patch, with $2\frac{1}{2}$ fathoms water upon it, lies, S.W. by W. $\frac{1}{2}$ W. 8 miles from Redscar head; between this patch and Aplin isle are some other shoals, upon which were found depths of 5 and 6 fathoms; there is also a patch of only 2 to 3 fathoms water bearing W. $\frac{1}{2}$ N. $4\frac{1}{2}$ miles from Red cliff.

The $2\frac{1}{2}$ -fathoms patch and the shoals between it and Aplin isle, just described, appear to form part of the sunken barrier, extending from 8 miles W. $\frac{3}{4}$ N. of cape Suckling to Aplin isle, other parts of which were met with, showing its probable trend to be about N.W. and S.E., nearly following the general direction of the coast, and stretching across Redscar bay at a distance of about 12 miles from its bight.

These dangers have not been closely sounded, they should therefore be approached with great caution by vessels nearing Redscar head; the lead must be kept constantly going, with a good look-out from aloft. These precautions are equally necessary in nearing any part of the southern coast of New Guinea. When near the perfect barrier it is easily distinguished by breakers or otherwise, at the surface of the sea, but when a ship is near the line of its general trend, without any reef being visible where it might have been expected to be seen, the greatest vigilance is necessary, as she may strike upon some unseen part of the sunken barrier without the slightest warning. The *Bramble* had several narrow escapes from these dangers while delineating the coast-line of the southern shores of New Guinea.

FISHERMEN ISLANDS are a low, flat, sandy group, covered with trees; the largest island is 3 miles long E.N.E. and W.S.W. and one mile broad, and lies 3 miles S.W. by W. from Palli-Palli point.* Four of the group are small islets close to the south-eastern side of the largest island, with which they appear to be connected by shoal water; the outer islet, about one mile long, is a little more than one mile eastward of the large island.

The natives of this neighbourhood are numerous and of a dark copper colour; they use bows and arrows, and have large canoes, some of which carry four mat sails.

The **BARRIER REEF** trends S.E. by E. $\frac{1}{2}$ E. from Aplin island touching the southernmost of the Fishermen isles, and from thence extends 5 miles eastward, to Basilisk passage leading towards port Moresby.

* These islands were so named from some of the canoes which came off to the *Bramble* having in them seines of considerable length, with floats of some light wood, and sinkers, fitted like English nets of the same description.

In the space between the inner edge of the great coral reef and this part of the coast the reefs are plainly visible, and well defined in clear weather from the masthead. The least water found between the south-west end of Lily island and the reef was 5 fathoms, where the passage is only one mile wide: the island should be given a wide berth, as the water round it shoals rapidly.

The least water found by H.M.S. *Sappho* between Caution bay and port Moresby was 4 fathoms.

BASILISK PASSAGE, $2\frac{1}{2}$ miles to the eastward of the eastern Fisherman island, is about three quarters of a mile in width, and clearly visible between the reefs which break on either side. A course N.E. $\frac{1}{4}$ E. leads through, no bottom being obtained at 21 fathoms. Immediately inside this passage a coral patch with 3 fathoms was passed over by H.M.S. *Conflict*, the bottom appearing to be uneven, with Paga hill bearing N. 11° E., and the south end of Elizabeth island N. 41° W., but the water deepens again, and 11 to 12 fathoms may be carried into port Moresby.

The COAST.—From Red cliff a bold coast, backed by reddish barren-looking hills extends 8 miles to the S.E. $\frac{1}{4}$ E. to Palli-Palli point.

LILY ISLAND.—This island, lying $1\frac{1}{2}$ miles off shore, and nearly 3 miles southward of Red cliff, is about 2 miles in circumference, low, wooded, and fringed with extensive shoals; between the island and the shore are patches which dry at low water.

PALLI-PALLI POINT, the western entrance point of port Moresby, is steep and rocky, and slopes down from a round-topped hill just above it; close off the point there are two islands, which from seaward appear as part of the point. The larger of these islands is named Mourilyan island, and the other, Elizabeth island.

Mourilyan Island is about 300 feet high, grassy, sprinkled with trees, about half a mile long and 350 yards wide, and separated from Palli-Palli point, by a boat channel full of coral patches and rocks.

Elizabeth Island is formed by two abrupt hills, about 180 feet in height, connected by a coral beach which covers at high tides. The island is about 700 yards long and very narrow, and is surrounded by a small shore reef, a narrow passage, in which 3 fathoms were found, separates Elizabeth island from Mourilyan island.

PORT MORESBY.—The entrance to port Moresby is between Palli-Palli point and Paga point, which is $1\frac{1}{2}$ miles E. $\frac{1}{4}$ S. of it. From the entrance the port extends in a N.N.W. direction for 3 miles, maintaining a width of from $1\frac{1}{2}$ to $1\frac{1}{4}$ miles, it then bends to the westward for $1\frac{1}{2}$ miles, and forms Fairfax harbour. The depth of water in the port

decreases gradually from 18 fathoms at the entrance to 4 fathoms in Fairfax harbour.*

Jane Island, a bold conical island about 600 feet in height, situated at $2\frac{1}{2}$ miles within the entrance point of port Moresby, forms a good leading mark for that port at all times. A village is built on its north side, and the natives have a good well of water.

FAIRFAX HARBOUR.—A channel nearly half a mile wide, to the west of Jane island, with a depth of 6 to 7 fathoms, leads into Fairfax harbour, which is land-locked, with extensive anchorage ground for a large number of ships, in from 4 to 5 fathoms. The north-west arm of the harbour is shoal nearly half a mile from the head of it, and the shores are fringed with coral reefs. Although high land surrounds the harbour, the only available water found, was in water holes on the grassy valley which lies on the north-west side of the harbour, in the rear of mangrove bushes. Boats can obtain water from one of these water holes the position of which is distinctly marked by a narrow clear opening in the mangrove bushes leading to the valley, but at low tide a great length of hose would be required.

Pigeons and Wallaby abound in the neighbourhood.

The soil in the neighbourhood of port Moresby is very poor and produces very little; the natives therefore procure supplies of sago, arrowroot, yams, and bananas from cape Possession; they also obtain fish and coconuts from Hood point.

The country inland for the distance of 20 miles north-east of the port has been explored by Mr. Octavius C. Stone, who found that about 12 miles distant the land was intersected by many mountain streams and was very fertile, producing bread fruit, melons, cucumbers, bananas, &c., in great abundance. There were numbers of villages, the natives being inoffensive and friendly, although greatly frightened at the first sight of the stranger.

There is a large village on the eastern shore inside Ethel island, at $1\frac{1}{2}$ miles from Paga point; there are also villages on the hills about the port, the ground around them being well cultivated.† A Mission station

* See Admiralty plan: port Moresby and Fairfax harbour, also sketch of the approach to port Moresby, through the Barrier reef; No. 2,126; scale, $\frac{1}{2}$ = 3 inches.

† Mr. Ingram, who represents the Queensland Government at port Moresby, supplies the following information:—"Good anchorage is obtainable under the south head in about 6 fathoms, at $1\frac{1}{2}$ miles from the shore. Deep water is found close to the eastern head, from which a native track runs round the harbour to the village of Annapata, and the colonists party in landing their horses availed themselves of this part of the harbour, the vessel being warped to within 100 yards of the beach, to swim the horses ashore. Hills skirt the harbour from the eastern head to Annapata, where they lie back from the beach giving abundant room for a township. Water has to be brought

is established at port Moresby, but fever is very prevalent and fatal amongst the teachers.

Tides.—It is high water, full and change, at port Moresby at 8h. 30m. ; springs rise about 6 feet.

DIRECTIONS.—Port Moresby can be approached by the inshore passage from Redscar head, but this route is only recommended for steam vessels or small sailing vessels. A clear deep channel also leads for about 3 miles from Basilisk passage into the port, a depth of 12 and 10 fathoms being carried. After passing Mourilyan island a good-look out must be kept for the coral patch which lies about 3 cables off the west shore, and about half a mile S. by W. $\frac{1}{2}$ W. of the south-west point of Jane island. A coral reef (*Conflict reef*) a quarter of a mile long, in a north-west and south-east direction, and 200 yards broad, awash at low-water, lies S.W. by W. $\frac{1}{2}$ W. from the south-west extreme of Ethel island, distant 7 cables. The south part of the eastern shore of port Moresby is fringed by a reef extending half a mile from the shore as far as Jane island, where it runs off one mile, enclosing the island and entirely blocking up the passage between it and the mainland. A shoal nearly awash at low-water, lies N. by W. $\frac{1}{2}$ W., distant 3 cables from Paga point.

WALTER BAY.—Pyramid point, so named from its shape, is a rocky and barren projection of the mainland, 645 feet high, and may be seen from a distance of 30 miles, having then the appearance of an island. It lies S.E. by E. $6\frac{1}{2}$ miles from Paga point, the space between, Walter bay, is nearly 3 miles deep, with a steep shore rising abruptly to a continuous ridge of reddish, barren-looking hills. Georgie island, which is very small, lies one mile from the shore on the eastern side of the bay. There are from 15 to 16 fathoms water across the entrance of the bay, but inside it has not been examined.

Locol Islet, which is small and barren, lies off the entrance of this bay, S.E. by S. 3 miles from Paga point ; it is moderately high, and shows white from seaward. A shoal, with 3 fathoms on its extreme, extends half way between the nearest point of the eastern part of the bay and the island.

Bootless Inlet.—On the east side of Pyramid point is a deep inlet extending apparently 4 miles to the northward ; but the entrance is so blocked up by reefs that no advantage could be taken of the deep water inside.

“ from two springs at the foot of the hill, about a mile from the village. The natives “ closely resemble the Polynesians of the New Hebrides group ; the total number in “ port Moresby is about 1,000. Sugar cane of a superior description, the sago palm, “ and native flax, also cedar could be made available for commercial purposes. Tobacco “ is grown by the mountaineers.”

The Lalokie river takes a course almost parallel to the coast, running between the main range and the east hills, and empties itself into Redscar bay, about 40 miles from port Moresby, page 485.

Head islands, are a group of small detached islands, lying about $2\frac{1}{2}$ miles to the eastward of Pyramid point.

The COAST.—From Bootless inlet, a low irregular shore, with hilly points, and several rocky islets lying close off it, trends south-eastward 9 miles to a large village and Mission station on a sloping point of the mainland. From thence the shore assumes a more bold and regular aspect, extending in the same direction, 18 miles farther, to Round head, a conspicuous hill on a projecting bend of the coast. A low coast range extends from the village to the head, the south-eastern and greater portion of which consists of sterile-looking sandy hills, covered with scrub and stunted bushes.

Round Head is a round hill of moderate elevation, covered with scrub and bushes, and visible at a distance of 30 or 35 miles; it is most conspicuous when seen from the westward, from which direction it looks like an island. About $2\frac{1}{2}$ miles north-eastward of the head is a large village named Palavain.

Caution.—As numerous coral patches exist in the vicinity of Round head, extending from 5 miles north of the head to about the same distance south of it; great care is requisite when navigating among them, as, except under favourable conditions, they are not seen well from aloft.*

Mount Astrolabe is a remarkable, square, flat-topped mountain, rising at $6\frac{1}{2}$ miles behind the portion of coast just described; its summit (near the centre), in lat. $9^{\circ} 31' S.$, long. $147^{\circ} 25' E.$, is 3,824 feet high. The table top of this mountain extends 15 miles in a N.W. and S.E. direction, and terminates abruptly at each extreme; but from the south-east shoulder a sharp ridge of barren-looking hills, with scrub and some trees growing upon them, gradually descends to Round head. Near the edge or brow of the mountain are precipitous cliffs; but on the south-west side, below these cliffs, it slopes gently towards the sea, with numerous valleys, in which the richest vegetation was seen. There are many villages high up on this side of the mountain, with patches of cultivated ground, which together with several mountain streams and cascades had a most pleasing appearance.

Mount Owen Stanley, bearing N.E. by N. 40 miles from the head of port Moresby, lies in lat. $8^{\circ} 53' S.$, long. $147^{\circ} 32' E.$, and is the highest summit of Owen Stanley range, noticed at page 483. It is remarkable for its square top, and cannot be easily mistaken, on account of its great height, 13,205 feet; a sharp ridge descends from it south-westward, towards the sea. At 10 miles north-westward of it, there is a sudden slope from the top of this lofty chain of mountains, which is here succeeded

* Remarks by Navigating Lieutenant Penn, H.M.S. *Sappho*, 1878.

by two ranges of inferior height, extending about 25 miles from N.W. to S.E., and approaching the shore behind Redscar bay. The most elevated of these two ranges is that farthest from the coast, which near its south-east end is 7,270 feet in height.

Aspect.—Between Redscar bay and the mountains just described, the country appeared flat for a considerable distance from the sea, extending north-westward to the back of the coast range about cape Suckling, and south-eastward behind the Roua hills, to mount Astrolabe.

A remarkable, sharp, and well-defined double peak was seen somewhere about 20 miles eastward of cape Suckling, detached from the inner range : is was only observed once, and consequently could not be laid down on the chart ; it was called Finger peak, from its shape.

The BARRIER REEF.—From Basilisk passage the reef, after taking a sudden bend south-westward, closes Pyramid point to within a distance of 2 miles ; it next nearly follows the direction of the coast, to about 4 miles north-westward of Round head, and then extends S. $\frac{1}{2}$ E. $8\frac{1}{2}$ miles to Round head entrance, a good clear opening S. by W. $\frac{1}{2}$ W. 7 miles from the head.

For the first 10 miles the barrier is continuous ; but for the next 8 miles it is broken by four openings, apparently navigable for at least small vessels ; the northernmost of these openings, at 4 miles south-eastward of Pyramid point, is the broadest, and if sounded might prove a safe channel for large vessels. South-eastward of these openings, the reef continues unbroken and awash, to within a few miles of Round head entrance, this latter part being covered ; but it is easily distinguished by the pale green colour of the water over it. The whole of the barrier reef, from Aplin island to this covered part of it, is awash and plainly shown by breakers.

H.M.S. *Sappho*, in 1878, found the channel between the barrier and the mainland, from port Moresby to Round head clear of dangers, except a few coral shoals, which were easily seen, until within 5 miles of Round head.*

ROUND HEAD ENTRANCE, which is easily made out by a bearing from Round head, is nearly one mile wide ; the end of the barrier forming the north-west side of the entrance being always covered, the sea does not break upon it in fine weather ; but the reef on its south-east side being nearly awash, the breakers on it distinctly point out the channel.

* In 1873, H.M.S. *Basilisk* found no bottom with 10 fathoms, while keeping about mid-channel between the Barrier reef and the main, from Pyramid point to Hood point.

There is good anchorage in 15 fathoms, at half a mile within the reef on the south-east side of Round head entrance, with perfectly smooth water, and sheltered from the sea, whichever way the wind blows.

No directions are necessary for going through this entrance, as it will be easily seen from the mast-head, by the sea breaking heavily upon the reef forming its south-east side.*

HOOD POINT is a remarkable tongue of low woody land, S.E. $\frac{1}{2}$ E. 18 miles from Round head, projecting 5 miles from the line of coast, and not visible from a ship's deck at a greater distance than 9 miles. There is a village called Hula on the west side of its extreme point, with extensive groves of cocoa-nut trees. The natives appeared numerous, and many large canoes were seen moored off the village, sheltered by the barrier reef.

There is nothing remarkable in the intermediate coast, except Paira point, a red cliff jutting out about midway between Round head and Hood point, with a bay on either side of it. A range of barren sandy hills extends south-eastward from Round head, between which and the shores of the bays the land is low and wooded.

The Coast from Caution bay to Hood point.—The general appearance of this country is a succession of abrupt, round-topped, grassy hills, sprinkled with trees, and bearing a striking resemblance to each other. They rise directly from the beach to an average height of 500 or 600 feet, and are backed by a higher range. The valleys are fertile, well wooded, and composed of a peaty, black, alluvial soil, which appears to absorb the water, for none was seen discharging itself into the sea.

Numerous bright green spots on the side of the steeper hills might easily be mistaken for water-falls when the sun is shining on them.

The only water noticed along the whole coast was at $1\frac{1}{2}$ miles to the northward of Round head, and half a mile from the beach, where there were two mounds with large water holes on their tops. The bay between Hood and Paira points contains two villages, built partly in the water; the ground is low, with hills beyond.

Round head to Paira point forms another bay, with the appearance of fresh-water creeks, has a village on the hills and another one at the waters edge.

Natives.—The whole extent of coast above referred to is dotted with numerous villages, many containing an estimated population of from four to five hundred.

The natives are apparently of Malay descent, copper coloured, but with the frizzled hair of the Papuan. Like the Malays, their houses are built

* See Admiralty chart of Papua, sheet 6, Round head to Orangerie bay, No. 2,122; scale, $m = 0.25$ of an inch.

upon tall poles, sometimes standing far out on the reefs. Their villages on the hills, surrounded by rudely cultivated ground, have a very picturesque appearance.

A more friendly, quiet race of people could not be met with; during three weeks stay amongst them, not a native was seen armed, and whether the boats were absent on detached service, or in the presence of the ship, the natives were equally harmless. Hostilities also appear to be unknown amongst themselves, their canoes, quite unarmed, traversing the coast and calling at the different villages in the most friendly manner.

So far as could be ascertained, in 1873, they had never before seen white men, they were perfectly unacquainted with the use of iron, white glass bottles or red beads being the only articles of trade they appeared to value.

THE BARRIER REEF from Round head entrance, sweeps round to within 2 or 3 miles of Paira point, and then out again 4 miles to the southward, forming a deep bight, the head of which is not enough known to show whether there is a safe opening through it or not. The barrier next trends to the eastward for about 4 miles, and then passes at a distance of 2 miles from Hood point, which it joins on the east side.

No safe channel exists from Hood point to Hood lagoon, and it would be dangerous for a ship to attempt to proceed beyond Hood point inside the reef.

This, and the other barrier reefs before described, like those of Australia, are precipitous, the bottom being very rarely reached with from 100 to 300 fathoms of line, close outside of them; they must therefore be approached with great caution, especially in light winds, when a sailing vessel would run great risk of being wrecked in consequence of being set on the reef, by the swell or in-draught.

COUTANCE REEF, S.S.W. about 28 miles from Hood point, is a white sand or coral shoal, on which the sea breaks. It was discovered in 1804, by M. Coutance, and was seen in 1860 by Mr. Kennedy, commander of the ship *Medway*, who places the north-west end of it in lat. $10^{\circ} 28' S.$, long. $147^{\circ} 28' E.$, or about 23 miles to the south-eastward of the position first assigned to this danger, where it was not seen when sought for by the *Rattlesnake* and *Bramble* in 1850. As the position of this danger is still doubtful, the locality should be passed with caution.

Hood bay, immediately on the east side of Hood point, is about 7 miles wide from East to West, and between 3 and 4 miles in depth; its shores are low and woody.

HOOD LAGOON.—The eastern point of Hood bay is like a pier, or embankment, forming the west side of a narrow opening, leading into the remarkable circular Hood lagoon, extending north-eastward nearly

4 miles into the flat woody country. The entrance appeared shallow, as it is almost enclosed by a broad point of the barrier reef, running out nearly S.S.W. $2\frac{1}{2}$ miles. No bottom could be reached with 100 fathoms, close outside this reef.

In 1876, Hood lagoon was visited by the Rev. Messrs. Macfarlane and Lawes, in the Mission steamer *Ellangowan*, which passed through a break in the barrier reef, well up towards the head of Hood bay on the east side, and then proceeded inside the reef to the entrance of the lagoon. These gentlemen describe the lagoon as being about 15 miles in circumference, with a clear entrance and anchorage inside; Dundee river empties itself at its head, and is about 300 yards wide at its mouth, narrowing to 80 yards at a mile within. The river was shallow at the entrance, but just inside, the depth was found to be 9 feet; it appeared to have its rise in a range in the interior, behind mount Astrolabe.

On the eastern side of the entrance to the lagoon is the large village of Kerepunu, the houses of which are well built, and the streets kept clean. Of the inhabitants, consisting of about 2,000, one part devote themselves to fishing, and the other to cultivating the ground, &c.

Among the natives, food did not seem very plentiful, with the exception of cocoa-nuts.

The following information is given by Navigating-Lieutenant H. S. Penn, H.M.S. *Sappho*, 1878. A reef extends from the eastern entrance point W.N.W. for 3 miles, approaching the north shore of Hood bay to a distance of one mile at its western extremity. The *Sappho* entered the lagoon by passing north of this reef, keeping about half a mile off the shore of Hood bay, and carried a depth of 5 fathoms to the entrance of the lagoon, where anchorage was obtained in 8 fathoms, mud.

The discoloured water from Hood lagoon renders it very difficult to see the reef at the entrance from aloft. A large vessel should not attempt to enter the lagoon, as some shoals of about $2\frac{1}{2}$ fathoms are situated within a mile of the entrance; anchorage may be found outside these shoals under shelter of the reef, in from 6 to 8 fathoms water.

Macgillivray range extends from the back of the hills behind Paira point, E. by S. 18 miles, and is moderately high, scantily wooded, and sandy at the west end; the land between it and the shore is flat and thickly wooded, appearing from a distance to be of a rich alluvial description.

KEPPEL POINT.—From the east entrance of Hood lagoon, a continuation of the same flat woody coast, indented by several large though inaccessible bays, trends E. by S. $9\frac{1}{2}$ miles to Keppel point, which is a low projection of the mainland E. $\frac{1}{2}$ S. 15 miles from Hood point. Mangrove swamps, extending several miles inland, commence about 5 miles eastward of Hood lagoon, and continue round Keppel point.

From the projection of the barrier off the lagoon entrance, the reef forms a bight to the eastward, with its head touching the shore ; from the east point of this bight the barrier trends nearly E. by N. 5 miles to Keppel point, from which a reef-spit projects 3 miles south-eastward.

This appears the first instance seen upon this, or the eastern coast of Australia, of the barrier reef approaching so near as to touch the mainland.

Keakaro bay, from the western shore of which a reef extends nearly across to the opposite side, is situated immediately east of Keppel point.

Between Keakaro bay and Macfarlane harbour to the eastward, the land near the beach is sandy and dry, but farther back appears low.

MARSHALL LAGOON.—At E. by N. 7 miles from Keppel point is another low and thickly wooded projection, with a deep bay running into the low land between them. On the east side of the latter point the coast trends N.N.E. 4 miles to Macfarlane harbour, the outer expansion of Marshall lagoon, which is described by Messrs. Macfarlane and Lawes as being about 150 yards wide at its mouth, with a bar stretching nearly across, but by keeping close under the bluff point on the east side of the entrance, a narrow channel is found with from 3 to 5 fathoms in it ; inside the entrance the harbour opens out to about 5 miles in circumference, and is deepest on its western side, where the land is low and apparently swampy, on which is situated the village of Alomo. The lagoon then narrows to half a mile, after which it opens out to Marshall lagoon, a finer sheet of water about 4 miles long and 2 miles wide, with a village on its eastern side (probable name Vanike). This second part of the lagoon is shallow in the centre, and narrows at its head into a river about 120 yards wide, which again widens to 200 yards, after which it narrows. The course of this river, to which the name of Devitt was given, was followed for $1\frac{1}{2}$ miles, where it opened into a small lagoon, from which two branches ran, one N.N.W. and the other S.E. The S.E. branch was followed for a short distance ; its width was 100 yards and depth 2 fathoms.

The natives of the village in the large part of the lagoon bartered freely, but appeared frightened ; their houses are situated on a sand-bank, surrounded by water, and thus the village has the appearance of being built in the water.

The eastern entrance point of Macfarlane harbour is a high bluff, between which and cape Rodney, 14 miles eastward of it, are three bays in the coast, which, for the first 7 miles from the opening is high and steep, but afterwards low and woody, to cape Rodney. Three small islets, a reef and sand-bank, were seen off this part of the coast by the above gentlemen.

Cheshunt bay, the third bay and about 11 miles eastward of the entrance to Macfarlane harbour, between cape Rodney and Brethren islands, a group of five rocks covered with brushwood, lying N.W. by W. from that cape, distant 4 miles. The *Ellangowan* anchored on the eastern side of this bay. A bank which uncovers at low water extends some distance from the shore at the head of the bay.

A considerable stream, to which the name of Cheshunt river was applied, discharges into the sea at the head of Cheshunt bay; a depth of one fathom was found at the entrance, immediately inside of which the water in mid-channel deepened to 3 fathoms, and maintained that depth for some distance; at about 6 miles from the entrance the depth was found to be 10 feet. After passing the entrance points a large stream coming from the northward empties itself into a fine basin; 3 miles eastward of this, Cheshunt river is joined by another stream from the northward 75 yards wide, to which the name of Reynolds river was given; between these rivers the main stream is about 150 yards wide, the banks on both sides being covered with mangroves; above Reynolds river the stream narrows to 100 yards, contracting to a width of 75 yards at 6 miles from the entrance, at which position the tidal influence was still experienced.

CAPE RODNEY is not easily recognised, as it is only a low wooded point; there is a bay nearly 2 miles wide, on its east side. Some wooded hills of moderate height, and visible about 25 miles off, rise from 5 to 8 miles north-westward of the cape; the south-eastern hill is saddle-shaped.

A shoal extends about half a mile from the shore along the southern edge of this cape, and detached coral dangers lie between it and the Barrier reef.

COUTANCE ISLAND.—BARRIER REEF.—Coutance island, about half a mile long and one quarter of a mile broad, with a sandy beach round it, is low, wooded, and frequented by large numbers of pigeons; it lies E. by S. $\frac{3}{4}$ S. 9 miles from Keppel point, and close within a point of the barrier, which from thence first trends S.E. by E. $\frac{1}{2}$ E. 9 miles, and then E.N.E. about the same distance; it afterwards sweeps round to the northward, terminating in a chain of small detached reefs, reaching within one or 2 miles of cape Rodney.

No soundings could be obtained with 100 fathoms, close outside this part of the barrier, nor was there any opening seen through it; but between the reef extending from Keppel point and Coutance island is a clear opening 6 miles wide; this, together with the large trees and drift wood seen on the neighbouring reefs, would seem to be due to a great quantity of fresh water being discharged into the sea, from the rivers entering the Marshall lagoon, and other openings in this part of the coast.

The space between the barrier last described and the coast appeared navigable.

RODNEY ENTRANCE, S.S.E. 7 miles from cape Rodney, is an opening between the east bend of the reef extending from Coutance island, and the forked end of the barrier next to the eastward of it. The opening is $2\frac{1}{2}$ miles wide, and clear of danger. There is good anchorage in 21 fathoms, immediately within the inner point forming the east side of the entrance; the water is smooth and there is shelter from all winds.

The breakers on the reef will be a sufficient guide for ships entering, and the only precaution necessary in picking up a berth is to anchor clear of the numerous detached coral patches inside.

The peculiarity of this opening is that depths of 13 to 40 fathoms were found at 2 miles off it; and there were 25 fathoms *outside* the barrier on the west side, at a distance of 3 miles from the entrance.

From cape Rodney to Sandbanks bay the *Ellangowan*, drawing 6 feet, found a good passage inside the Barrier reef.

Sandbanks bay.—This bay is situated about 10 miles eastward of cape Rodney; the eastern side is low and formed by a long reef and sandbanks extending from a mangrove swamp; a forest of large trees lines the shore round the head of this bay, and a river (Domaru river), said to be of considerable size, falls into the bay on the western side, off the mouth of which anchorage was found in 2 fathoms at low water.

CLOUDY BAY.—From the bay on the east side of cape Rodney, a continuation of the low, flat, woody coast extends E. by N. 12 miles, to a point forming the west side of Cloudy bay, which is 9 miles wide at the entrance formed by Colombier point to the eastward. The head of this bay was indistinctly seen, it being constantly hidden by dense clouds. Near the western side of Cloudy bay is Eugenia islet. The bay is divided by a reef extending from Sewell island in a south-westerly direction for a distance of $4\frac{1}{2}$ miles, off the extremity of which are several detached shoals; the *Ellangowan* anchored in the western portion of the bay, about $2\frac{1}{2}$ miles from Sewell island.

Sewell and Percy islands are situated eastward of Eugenia islet, about 3 miles from the head of Cloudy bay. Sewell island, the western of the two, is about 2 miles in circumference, and 100 feet in height. At low water it dries between Eugenia islet and the main, and also between Eugenia and Sewell islands. Percy island is low and wooded, about 2 miles in length, and separated from Sewell island by a channel, with 3 fathoms in it, and 150 yards wide.

Colombier point is the east entrance point of Cloudy bay; several detached shoals lie south of Colombier point and in the bight immediately east of it.

ROBINSON HARBOUR, found in the east part of Cloudy bay, inside Percy island, is about 5 miles long in a north-east direction, by three-quarters of a mile wide; it is about 200 yards wide at its entrance, and has from $2\frac{1}{2}$ to 3 fathoms water. It is surrounded by thickly wooded hills which slope down to the waters edge.

The best entrance either to Cloudy bay or Robinson harbour is by the passage to the eastward of Percy island.

The COAST.—A range of hills of no great height, extends along the coast from cape Rodney to Cloudy bay, the land being low and woody, both north of the range, and between it and the shore.

Between Sandbanks bay and Cloudy bay there is a small bight, into which a river flows.

Between Colombier point and Table point, the low woody shore forms two indentations, the eastern and larger of which has been named Baxter bay, and trends south-eastward nearly 11 miles to Table point, which is low, but well defined, and lies E. $\frac{1}{2}$ S. 31 miles from cape Rodney. On the beach in Baxter bay about 4 miles north-west of Table point, is the village of Dedele, consisting of about 15 houses surrounded by a strong stockade, 14 feet high. In Baxter bay the *Ellangowan* found good shelter from the trade wind. There are several shoals in the western part of the bay.

Rounded and Table-topped hills are two rugged-looking ranges covered with bush, and separated by Robinson harbour, extending from 5 miles eastward of the bight of Cloudy bay to 4 miles northward of Table point; the land between them and the coast is flat and woody.

The BARRIER REEF forms a bight, nearly 5 miles wide immediately to the eastward of Rodney entrance, which might, when coming from the eastward, be mistaken for the entrance, and if embayed there in light winds, a ship would run a great risk of being set upon the reef, as there appeared no opening through which she could escape destruction. From this bight the barrier was traced nearly 24 miles to the eastward, and appeared to terminate at about 4 miles S.S.E. of Table point; but its eastern extremity could not be minutely determined, in consequence of the last 9 or 10 miles of the reef in that direction across Table bay, being under water, although the sea breaks on this as it does upon the other part of this reef, which is awash; and no soundings were obtained at the back of it, with 100 fathoms line.

GRANGE ISLAND, which is low and wooded, lies, S.W. $\frac{1}{2}$ W. 4 miles from Table point, on the western extreme of the reef patches at this end of the Barrier which is awash. This island is very similar to Coutance island, but the anchorage off it is not so good. Pigeons are found in great numbers.

Owen Stanley Range trends from mount Owen Stanley, described at page 492, south-eastward 95 miles, and then turns suddenly north-eastward; the elbow thus formed is the nearest approach of the range to the southern coast of New Guinea, it being only 7 miles northward of the head of Cloudy bay.

As there is a great uniformity in the profile of this mountain chain between mount Owen Stanley and the elbow at the back of Cloudy bay, it will only be necessary to notice the three following summits:—

Mount Obree, North 40 miles, and mount Brown, N. by E. $\frac{1}{4}$ E. 32 miles from Keppel point have nothing remarkable in their appearance; the former is 10,246 feet and the latter 7,947 feet high.

Mount Clarence, N.N.E. $\frac{3}{4}$ E. 20 miles from cape Rodney, has nothing peculiar to distinguish it from the other summits of the range, except that its top is perfectly flat on the western side, and it is the nearest mountain of the chain to the shore. It rises to 6,330 feet in height, and is distinctly visible at a distance of 38 or 40 miles.

Between the base of these mountains and the extensive tract of level land from Round head to cape Rodney, are numerous hills; the most conspicuous of these is a remarkable pyramidal hill, the position of which, as well as of the other hills N.W. and eastward of it, could not be determined.

TABLE BAY, between Baxter and Amazon bays, is a slight indentation of the mainland on the eastern side of Table point; its eastern extreme is a low point on the west side of a well-defined opening, like the mouth of a river, at E. $\frac{1}{2}$ N. 20 miles from Table point. The shores of this bay are a fine tract of level land, thickly wooded, which lies between the coast and the Inskip and other hills rising behind, at 2 to 3 miles from the shore, between which extensive valleys were seen.

AMAZON BAY, which is much encumbered with shoals, lies between the eastern point of Table bay and a bold hilly head-land, at E. by S. $\frac{1}{2}$ S. 7 miles from the point; the bay was entered from the westward by passing between the western Amazon island and the mainland. The depth of the bay was not exactly ascertained; but sandy beaches were seen, with some fertile-looking land, backed by the Brady hills, an irregular, steep, thickly wooded range, from which a ridge descends south-westward to the shore, making this a double bay.

AMAZON ISLANDS, two in number and surrounded by coral reefs, are small, low, and woody, with a sand-bank, lying from $1\frac{1}{2}$ to 3 miles off the western part of the bay. There is a remarkable double rock at $1\frac{1}{2}$ miles eastward of these islands, and connected to the eastern one by a

reef, between which and the western Amazon island there is anchorage for small vessels.*

TOULON ISLAND, the northern of two small islands lying about 6 miles off Amazon bay, is nearly 3 miles in circumference, and rises sharply in the centre from the narrow belt of low land which extends half round the island to a peak 300 feet high, visible from a distance of 30 miles. The island is clothed with trees and grass, and there are many cocoa-nut trees at the foot of the hills. There is a large village on this island. A reef encircles Toulon island.

TURTLE-BACK ISLAND lies one mile to the southward of, and is smaller than Toulon island; it is round-topped, as its name implies. A rock above water lies nearly midway between the two islands.

Mayri Bay, a fine large bay at the eastern extremity of Amazon bay, affording good safe anchorage in south-east winds.

CETTE ISLAND, 6 miles eastward from Toulon island, is small and rocky, with a few trees on it. Two high rocks lie near the island, one close to its southern side, and the other at three-quarters of a mile to the westward of it. At about $1\frac{1}{4}$ miles south-westward of the latter is a dangerous 3-fathoms patch.

These islands and Amazon bay are thickly inhabited by a hostile people, who have large canoes with square platforms upon them; their arms are chiefly spears. Upon one occasion they prepared to attack H.M.S. *Bramble* when becalmed near the islands.†

A DRY SAND BANK lies S.W. $\frac{1}{2}$ W. $5\frac{1}{2}$ miles from Toulon island, on the western part of a coral reef 3 miles long, which covers at high water. The north side of the reef appeared steep-to; but a spit of foul ground runs out about one mile from its western end. There is good anchorage in 20 fathoms, at one mile northward of the sand-bank, with smooth water in the south-east monsoon.

The soundings between Grange and the Toulon islands range from 15 to 50 fathoms, as far as 10 miles off the land; outside this no bottom could be reached with 100 fathoms of line. At about 13 miles westward of Toulon island, the *Bramble* got into $2\frac{1}{2}$ fathoms, with coral bottom, which appeared to be on a detached reef. About 5 miles north-westward of this reef and from 5 to 8 miles eastward of Table point, breakers have been seen.

Millport harbour, situated midway between port Glasgow and Mayri bay, with a depth of 3 fathoms in the entrance, apparently afforded good anchorage.

* The Rev. Mr. Macfarlane in the mission steamer *Ellangowan* found the entrance to Amazon bay both from the east and the west to be near the mainland, and about one mile wide.

† Amazon bay derived its name from the circumstance of a canoe full of women having accompanied the party. In 1876, when the mission steamer *Ellangowan* visited Amazon bay, the natives appeared very peaceably disposed.

Port Glasgow, 2 miles in length, East and West, by three quarters of a mile broad, situated in lat. $10^{\circ} 22' S.$, long. $149^{\circ} 30' E.$, has depths of from 5 to 7 fathoms; the entrance which appears clear of danger being to the south-east.

The COAST.—From the western point of Amazon bay to a few miles east of port Glasgow, the hills, covered with vegetation, come boldly down to the shore; plantations are seen on the sides of many of them as high as 1,000 feet above the sea. From Island bluff, the eastern extreme of these prominent headlands, a lower coast range extends about $3\frac{1}{4}$ miles northward and 6 miles eastward.

JULIADE ISLET, S.E. 3 miles from the Bluff, is small and wooded, having a knoll at each end, East and West, with a sandy beach between them on the south side. There is a dangerous 3-fathoms coral patch at S.S.W. 3 miles from the islet.

ORANGERIE BAY extends about 21 miles in an easterly direction from Island bluff just noticed, to the north point of the entrance into Mullens harbour, and is about 4 miles in depth, but it is encumbered with an extensive reef. Its low woody shore forms a continuous curve from one end of the bay to the other. For the first 6 miles eastward of Island bluff, the steep coast range rises from the shore; but eastward of these hills, a flat and thickly wooded country, intersected by numerous creeks, extends a considerable distance inland. The western and greater portion of this bay has not been sounded near the shore; but one or two small islets were indistinctly seen close to the land at 3 miles eastward of Island bluff.

DUFASURE ISLAND, lying on the eastern side of Orangerie bay, about 2 miles off the entrance into Mullens harbour, is hilly, and nearly 3 miles long from North to South, and 2 miles broad; it is thickly wooded, and in most parts rises abruptly from the sea; its summit, which is 1,622 feet high, is near its north-eastern side, in lat. $10^{\circ} 29' S.$, long. $149^{\circ} 49' E.$ On its south-west side are two bays, in one of which is a large village, with groves of cocoa-nut trees; and on the north-east side is a village, also with cocoa-nut trees near it.

There are several detached rocks near the north-west point of Dufasure island; Orange rock, the largest and most conspicuous of which, lies three-quarters of a mile westward of the point; there is deep water between it and the island.

A bank of foul ground, on which the sea breaks heavily, lies from one to 4 miles westward of Dufasure island; the soundings between its south-eastern edge and the island are irregular, varying from 7 to 30 fathoms.

Several reefs awash are said to exist to the southward of Dufasure and

adjacent islands, and about 3 miles northward of that portion of the **sunken Barrier** reef lying between the meridians of $149^{\circ} 43'$ E. and $149^{\circ} 50'$ E.

ROPO-ROPO ISLET is a small cliffy island of moderate height, one mile south-west of Dufaure island. Two rocks lie close to the eastward of it; and there is a village in a bay on the north-eastern side.

QUOIN ISLET, one mile south-eastward of the south point of Dufaure island, is a rock, shaped as its name implies. At N.E. half a mile from the islet is a high rocky promontory forming the north-west side of Argyle bay. Between this promontory and Dufaure island is good passage three-quarters of a mile wide, and from 6 to 10 fathoms deep.

The natives of Dufaure and the neighbouring islands are also numerous; they unhesitatingly came off to the *Rattlesnake* and *Bramble* with yams, cocoa-nuts, pigs, and other productions, which they readily bartered for hatchets, iron-hoop, &c.; they appeared very friendly, but might prove troublesome to a small vessel, not over-manned. Several streams were seen running down the steep valleys on the western side of the island.

ANCHORAGE.—The *Rattlesnake* and *Bramble* anchored off the western side of Dufaure island, the former at $2\frac{1}{2}$ miles, and the latter one mile from the shore; but both these anchorages were exposed to the swell. The best anchorage is at half a mile north-eastward of Orange rock, and may be easily reached by passing close to the rock on either side; but for a weak-handed vessel this anchorage has its disadvantages, being so near the mainland, which is very populous; and as the inhabitants have large canoes, an attempt might be made to board a vessel.

In the channel between Dufaure island and the mainland there is anchorage in 10 or 12 fathoms, but a vessel ought not to proceed beyond the small island off the N.E. end of Dufaure island, as the water shoals gradually to 2 fathoms, and it appears to be shoal for a long distance to the northward.

In approaching Dufaure island, a good look-out must be kept for two coral shoals, one at 12 miles south-westward, and the other 10 miles southward, of the highest part of the island; the former has 5 fathoms, and the latter 6 fathoms on it, but there may be less. As no soundings were obtained close outside these shoals, they appeared to be portions of the sunken Barrier, of which the probable trend is about E. by S. from Grange isle, *see* page 500, passing close outside the sand-bank south-westward of Toulon island. Few soundings were obtained between this line of sunken Barrier and the coast, from Table point to Dufaure island; but they appeared to vary from 15 to 30 fathoms, and dangerous 3-fathoms coral patches were frequently met with.

MULLENS HARBOUR, situated in the eastern part of Orangerie bay, eastward of Dufaure island, is about 8 miles long East and West by about 4 miles wide, and has depths from 9 to 11 fathoms. The entrance, which is on the western side of the harbour, is about one mile wide and appeared free from obstruction.

On the shores of the harbour are numerous sandy beaches of considerable length, with groves of cocoa-nut trees. The villages in the vicinity of Mullens harbour are numerous and well populated. The natives are light in colour, and are a fine looking race; hoop-iron was in great demand among them; their behaviour was friendly, but a disposition to steal was often displayed.

A CORAL SHOAL, over which the *Rattlesnake* passed in 7 fathoms, with the bottom clearly seen on either side, lies S.W. 9 miles from the summit of Dufaure island; Toulon island bearing at the same time W.N.W. This shoal is the more dangerous from being between 2 and 3 miles within what has been considered the edge of the sunken Barrier.

Owen Stanley Range, from its nearest approach to the sea at the back of Cloudy bay, as noticed at page 501, takes a sudden turn north-eastward 18 miles to mount Suckling, the summit of which is quite flat-topped on its eastern side; this mountain bears N.E. by E. $\frac{1}{4}$ E. nearly 22 miles from mount Clarence, and is 11,226 feet high, it being the next in height to mount Owen Stanley.

From mount Suckling the highest part of the range trends nearly in a direct line E. by S. $\frac{1}{2}$ S. 60 miles to mount Thomson, which is 5,901 feet high, and bears nearly North 20 miles from Dufaure island.

The only intermediate summits worthy of notice are, mounts Dayman and Simpson; the former, which is 9,167 feet high, is 20 miles, and the latter, 9,972 feet in height, 44 miles from mount Suckling. The top of mount Simpson is round at each end, with a peak in the centre.

Most of the heights of this chain of mountains are visible, in very clear weather, at a distance of 90 miles; but within 20 or 30 miles of the coast, they so alter their shape as not to be easily distinguished. They are visible for the longest periods during the north-west monsoon, as they are generally capped with clouds during the greater part of the other season of the year.

The highest summits of the range were too distant to show whether any of them are volcanoes or not; but there is every reason to believe that some of them have been, as a piece of lava was brought off to the *Bramble* by one of the natives of Dufaure island.

Argyle Bay is a deep indentation between Dufaure island and Eagle point its southern horn.

EAGLE POINT is a sharp rocky projection of the mainland, lying S.S.W. $\frac{1}{4}$ W. $4\frac{1}{2}$ miles from the south point of the entrance to Mullens harbour; the coast between these points is low and woody 2 miles from the harbour, and then becomes steep and hilly to Eagle point.

Close off Eagle point are the Eagle rocks, one of which looks, from the sea, like a vessel under sail. The water in the neighbourhood was observed to be of a pale green colour, but in standing through it, no difference was found in the soundings.

Cone Point, S.E. by E. $\frac{1}{4}$ E. 2 miles from Eagle point, is so called from having a remarkable conical hill on it, 543 feet high; the shore is steep and rocky, with a small, but deep bay between the points.

The COAST.—From Cone point the coast, consisting of a series of low points and deep bays with sandy beaches, to which the names of port Dudfield, Ellangowan bay, and Meikle bay have been given, trends E. by S. $\frac{1}{4}$ S. 16 miles to Tree islet, which is small and rocky, with one or more trees on it, lying close off a low cliffy point, forming the west extreme of Farm bay.*

Port Dudfield, just to the eastward of Cone point, is completely landlocked, with a depth of 10 fathoms in the centre, and 7 fathoms at the head.

Ellangowan Bay is described as a fine bay of considerable extent, next eastward of port Dudfield.

Webb Islands are two or three small islands near the shore, from 2 to $3\frac{1}{2}$ miles eastward of Cone point.

Roux Isles form a cluster, five in number, lying a short distance off the mainland, nearly midway between Webb islands and Tree islet. Both these groups of islets have cocoa-nut trees on them.

A shoal with 2 fathoms water on it is reported to lie in lat. $10^{\circ} 41' S$, long. $150^{\circ} 2' E$. (approx.), or S.E. $\frac{1}{4}$ E. from the southern Roux island, distant $2\frac{1}{2}$ miles.

Isabel Cove affords a small but good anchorage, sheltered from all winds. The entrance to the cove is easily known by a remarkable-looking rock, on the east side of the bay, on which stands a prominent tree, about half a mile from the land. It is about $5\frac{1}{2}$ miles eastward of Cone point; fresh water is easily obtained from a stream near the beach, close to one of the villages, of which there are three on the shores of the bay, called Bau, Gogohe, and one other. The houses of the natives seemed poor.

Fyfe Bay, formed between Roux islands and the mainland, afforded anchorage to the *Ellangowan* in 6 fathoms water.

* See Admiralty chart of New Guinea, sheet 7, Orangerie bay to Bramble haven, No. 2,123; scale, $m = 0.25$ of an inch.

FARM BAY is a deep inlet between Tree islet and Rugged head, a bold steep head-land E. by S. $\frac{1}{2}$ S. 4 miles from the islet. The northern shore of the bay is, for the most part, low and wooded, rising to a small coast range, the side of which, facing the bay, was very extensively cultivated, to which circumstance the bay owes its name. The eastern shore is steep, rising abruptly from the water to rugged hills of considerable height, covered with dense scrub, through which sharp points of rock were seen protruding.

Farm peak, the highest of these hills, is a double peak, at $1\frac{1}{2}$ miles northward of Rugged head it is 1,806 feet high, and most conspicuous when seen from the westward, from which direction it shows out very distinctly, and may be seen at a distance of 30 miles.

The bay was not sounded; but the *Bramble* anchored in 22 fathoms, mud, just within the entrance, and found the water quite smooth, in the south-east monsoon.

Baxter Harbour, at the head of Farm bay, afforded anchorage in 6 fathoms water.

The natives were very numerous and disposed to be hostile; they had a great number of large canoes, and were well armed with formidable spears.*

Rugged Head, $4\frac{1}{2}$ miles W. by N. $\frac{1}{2}$ N. of South cape, had the appearance of being an island.†

STACEY ISLAND.—**South Cape**, at one time supposed to be the southern extremity of New Guinea, is the south point of Stacey island, which is separated from the mainland by a channel averaging from one mile to half a mile in width, with 9 to 10 fathoms in the narrowest and shoalest part, opposite the Mission station.

H.M.S. *Sappho*, in 1878, found good anchorage in 13 fathoms, about a quarter of a mile W.N.W. from the Mission station established on the

* In 1849, H.M. schooner *Bramble*, shortly after daylight one morning, whilst becalmed in the bay, was in less than two hours surrounded by 43 canoes, each containing 8 or 10 men, who came boldly alongside; some of the natives had spears in their hands ready for an attack, and with great difficulty were prevented from boarding; fortunately a breeze sprung up, enabling the vessel to get away without having recourse to forcible measures.

† Entering between Rugged head and Wedge rock, we steamed about 8 or 4 miles, and then opened up a fine passage, 5 fathoms deep, by which we entered Catamaran bay. What was formerly supposed to be the south cape of New Guinea we have named Stacey island. As we opened up the passage, we saw what appeared to be unbroken land on both sides for 12 or 14 miles. As we proceeded, the passages between Stacey, Tissot, and the Brumer islands opened up to the south. The island is hilly, the highest peak being about 600 feet above the level of the sea; it is triangular in shape, about 4 miles long, and populous.—*Voyage of Ellangowan*, by the Rev. S. Macfarlane, Proceedings of Royal Geographical Society, July 23rd, 1877; No. IV., Vol. xxi.

northern point of Stacey island. A black rock, awash at high-water, is situated W. by N. $\frac{1}{2}$ N., distant $4\frac{1}{2}$ cables from the extremity of this point.

Wedge Rock, at half a mile south-west of South cape, is 40 feet high, and derives its name from its shape.

Bertha Lagoon, of considerable extent, is situated immediately north of Stacey island, its western arm approaching Baxter harbour to within half a mile, making Rugged head a peninsula; in many places it is too shallow even for a boat, but on the western side a channel was found sufficiently deep to admit of the *Ellangowan* proceeding as far as the village, close to which a river falls into the lagoon.

ASPECT.—The country, for the first 9 miles eastward of Eagle point, consists of hills and woody valleys; the hills are all under cultivation, and on every side there are indications of active life: a steep lofty coast range then takes its rise, trending eastward 12 miles, to Cloudy mountain, its greatest elevation; it then gradually descends across the head of Catamaran bay.

CLOUDY MOUNTAIN, the highest part of the above lofty coast range, bears N. by W. $9\frac{1}{2}$ miles from South cape; it is 4,477 feet high, and visible in clear weather at least 40 miles off. There is nothing remarkable in its shape, except that it rises to a well-defined, rounded peak, when seen from the southward. Northward of Tree islet a ridge descends from the range towards the coast; and another ridge forming a bold shoulder, southward of Cloudy mountain, slopes steeply down to the low grassy lands between the heads of Farm and Catamaran bays.

CATAMARAN BAY is 5 miles wide from W.S.W. to E.N.E., and appeared to be about 3 miles in depth; but the shores were not very distinctly seen. High hills, with deep woody valleys between them, rise from the north-eastern side of the bay. The country about the head of Catamaran bay appeared rich and fertile and has several villages, the easternmost being called Varauru. There are two small islands in it, but the inner one was not clearly visible. The bay derives its name from the number of catamarans, which the natives appeared to consider preferable to canoes.

TISSOT ISLAND, 574 feet high and 3 miles eastward of South cape, is remarkable for having a rounded peak at either end, nearly East and West from each other. Large patches of clear ground were seen on the island, which is inhabited.

A sunken danger is reported to exist N.W., distant half a mile from the north-west extremity of this island.

The COAST.—From the eastern point of Catamaran bay the coast trends 6 miles to the eastward, with a steep range of hills rising at the

back of it, to the height of 1,304 feet. A detached coral reef, about $1\frac{1}{2}$ miles broad, extends along this shore, from the middle of the bay to $2\frac{1}{2}$ miles eastward of it. There is a sand-bank on the reef. Shoal water extends off shore for one mile between the east end of the reef and the Leocadie islands.

The southern edge of this reef is steep-to, and the sea breaks heavily upon it, as it does upon the neighbouring coast, exposed to the south-east monsoon, which may account for so many catamarans being seen, the natives probably finding them better adapted for pushing through the surf, than canoes.

Leocadie Islands are a group of small low islands and rocks, situated immediately westward of the west point of Inverary bay; between these and the sand-bank is a small island, the position of which is doubtful.

BRUMER ISLANDS, six in number, are small and of basaltic formation, lying south-eastward of Catamaran bay. The westernmost and largest of the group is $2\frac{1}{2}$ miles long, and from one quarter of a mile to three-quarters of a mile broad. The highest part of this island is a peak near its north-east end, 665 feet high, and bearing E. $\frac{1}{2}$ S. $8\frac{1}{2}$ miles from South cape.

Although the largest Brumer island rises to a steep ridge of hills, it is covered with vegetation, and extensive plots of fenced cultivated ground were seen on the sloping sides of the hills. There are two populous villages near the shore on the northern side, the houses—which have sharp gables—being built upon piles.

The inhabitants have catamarans and canoes; the latter are fitted with single outriggers and mat sails.

The second in size of the Brumer islands is much smaller than the first and of triangular shape, lying about one mile south-eastward of the north-east point of the largest island. There is a large village in a valley on its north-east side, with much cultivated ground about it.

The other islets of the group are merely four high rocks, extending about one mile south-eastward of the last described.

Brumer islands produce yams, bananas, cocoa-nuts, and bread-fruit, which they barter for iron-hoop, &c. A few pigs were seen, but the natives were unwilling to part with them.

A vessel by establishing a regular barter may obtain, in a few days, considerable quantities of yams and cocoa-nuts; but in a short-handed vessel great caution is required, as the natives are inclined to treachery, if they have an opportunity. A large cascade was seen near the north part of the principal island.

The *Rattlesnake* and *Bramble* anchored on the north-west side of the largest island, but the anchorage is not good, as the swell, with the prevailing south-east wind, rolls round both points; and the depth of water is from 30 to 40 fathoms, blue mud.

Between Brumer islands and the reef, already described, skirting the mainland eastward of Catamaran bay, is a channel nearly $2\frac{1}{2}$ miles wide, clear of all dangers.

SUNKEN BARRIER REEF.—Like Dufaure island, the Brumer group must be approached with caution, on account of the sunken Barrier, two portions of which were met with, one, with 10 to 15 fathoms, bearing S.W. by S. 5 miles, and the other, with 8 to 11 fathoms, S.E. $\frac{1}{2}$ E. 8 miles, from the peak of the western Brumer island.

The probable trend of the sunken Barrier, from Dufaure to Brumer islands, is E. by S. nearly parallel with the coast, from which it is distant 5 to 7 miles. On this line several coral patches were found, with from 5 to 7 fathoms on them; but as it was not closely sounded there may be many others, and with much less depth of water. Close outside this line of sunken Barrier, there was no bottom with 100 fathoms of line. The soundings between it and the mainland are generally regular, varying from 20 to 40 fathoms, at $1\frac{1}{2}$ to 3 miles from the shore.

H.M. schooner *Conflict* carried 15 fathoms with no bottom inside the sunken Barrier, between Quoin island and South cape.

The COAST from the point of the mainland north-eastward of the Leocadie isles to the south-east extreme of New Guinea, trends in a north-easterly direction for about $13\frac{1}{2}$ miles, and consists of high ranges of hills, intersected by woody valleys, descending in some places to the water's edge. A reef, having but little water upon it, lies close off the east point of Inverary bay, $3\frac{1}{2}$ miles eastward of Leocadie point. Half a mile West of the reef is a small islet, and a larger one is situated N.E. by E. $\frac{1}{2}$ E. 6 miles from Leocadie point, about half a mile from the coast.

Inverary bay immediately to the eastward of Leocadie point is $3\frac{1}{2}$ miles across and one mile deep.

Heath Reefs, an extensive cluster of shoal patches, were seen extending for 2 or 3 miles to the westward of Cocoa-nut rock; the tail of one of these was passed over by H.M.S. *Basilisk* in 7 fathoms.

Cocoa-nut Rock, N.W. by W. $\frac{1}{2}$ W. $2\frac{1}{2}$ miles from Arch islands, is a small high rock, with two cocoa-nut trees upon it. There is deep water between it and Arch islands.

ARCH ISLANDS, about $10\frac{1}{2}$ miles East of the eastern Leocadie island, are small, high, and lie close together, on a reef nearly 3 miles in circumference. Both are wooded, and the north-western islet, which rises to a peak of moderate height, has a remarkable perforation through its north point, from which it derives its name. There is a village with a grove of cocoa-nut trees, on its north side.

The *Bramble* anchored in 14 fathoms, coral, at one quarter of a mile westward of the arch, but found the tide streams strong, and received very little protection from the swell.

CASTORI ISLAND, S.E. $4\frac{1}{2}$ miles from Arch islands, is high, rocky, and covered with scrub; a reef with high rocks, extends one mile to the north-westward of it, and a rocky islet lies about $1\frac{1}{4}$ miles to the northward. Castori island may be approached within half a mile on its western side, but there is no good anchorage near it.

HEATH ISLAND, is situated about 17 miles E.N.E. from the peak of the west Brumer island, and is $4\frac{1}{2}$ miles long N.W. and S.E., by about a mile broad.* Of its two peaks the southern is the highest, rising to an altitude of about 1,000 feet; they appear in the shape of a saddle from the east or west, are well-defined and thickly wooded, forming a conspicuous mark for the locality of China strait.

Heath island has patches of well-cultivated ground, and on its eastern side are two villages. A small woody islet lies about a cable from the shore $1\frac{3}{4}$ miles E. by S. $\frac{1}{2}$ S. from the southern peak, and a reef, having three prominent rocks, surmounted with small trees, extends half a mile S.E. from its south-east point. An off-lying reef of flat-topped rocks, about one cable in extent, and 10 feet above water, is situated about 8 cables south-east from the same point, and between them and the shore reef is a depth of 17 fathoms. Three small islands lie in the channel west of Heath island.

H.M. schooner *Conflict* anchored in the bay on the north-east side of this island, in 9 fathoms, sand, with Dinner island bearing N. 5° E., and Peninsular point (Hayter island) bearing N. 60° E.

On approaching this anchorage from seaward, the soundings gradually decrease from a depth of 17 fathoms, sand. The bay, which has a white sandy beach, affords good shelter from S.E. winds.

A Missionary station has been established here.

Blanchard Island, (of D'Entrecasteaux,) S.E. $2\frac{3}{4}$ miles from the south-east point of Heath island, is nearly 2 miles long in an E.N.E. and W.S.W. direction, by about a mile in breadth. Its two most prominent peaks are situated near the north-east and south-west extremities. The north-east peak, which is the summit of the island, rises to a height of 400 feet. A wooded islet, half a mile long, lies one cable from the east point of the island; and a village was seen in a small sandy bay on its north-west side. The depths in the vicinity were not ascertained.

Midway between Heath and Blanchard islands, and about $1\frac{1}{4}$ miles S. by E. of the south-east point of the former, are three small islets, lying in a north-west and south-east direction, the middle being the highest

* Heath point or Heath island was the eastern limit of the coast survey made by Captain Owen Stanley, R.N., H.M.S. *Rattlesnake*, 1850.

(about 250 feet); they are rocky and wooded, but were not closely examined, or sounded around.

Beehive Islet, so named from its shape, is small, steep, rocky, and about 250 feet high. It is distant rather more than 2 miles S.E. of the east point of Blanchard island, and affords a good mark, appearing steep-to, and free from surrounding dangers.

DUMOULIN ISLANDS are four small rocky islets of moderate height, and four detached rocks above water. The north-westernmost and largest of the islets, is nearly one mile long N.W. and S.E., and rises to a peak 400 feet high, bearing nearly E. by S. 23 miles from the highest peak of the Brumer islands.

The second island in size, which is about 250 feet high, lies E. by S. $\frac{1}{4}$ S. $2\frac{1}{2}$ miles from the largest; the other islets and rocks, most of which have scrub and a few trees growing upon them, lie scattered between the two just described.

The north-westernmost islet is inhabited, and produces yams and coconuts in considerable quantities, which the natives exchanged for iron-hoop. The *Bramble* anchored in 26 fathoms at about half a mile from the islet, but it is too small to afford protection from the swell.

CAUTION.—In approaching the Dumoulin group from the southward, great caution is necessary, and the lead must be kept going, as the *Rattlesnake* passed suddenly from no soundings with 100 fathoms, to 12 and 16 fathoms, at S.W. by W. $\frac{1}{4}$ W. 4 miles from the north-westernmost islet, and still more shallow water may yet be discovered. There is a similar sudden shoaling of the water, at 4 miles south-eastward of the same islet, the least depth found being 12 fathoms.

These two patches of shoal water seem to form parts of the south-easternmost portion of the sunken Barrier reef of the south coast of New Guinea, which here extends about E.S.E. 22 miles or more from the shoal south-eastward, of Brumer islands.

At halfway between Brumer and Dumoulin islands, and about 2 miles outside the line of the sunken Barrier, there is a depth of 15 fathoms with deep water inside it, whilst at $4\frac{1}{2}$ miles westward of it, and nearer to the line of barrier, no bottom could be found with 170 fathoms of line. There are also several patches of 7 and 8 fathoms, with deep water round them, lying about 5 miles north-eastward of the south-east Dumoulin island. These irregularities of soundings render great caution necessary in approaching the coast, more especially as the water must be very shallow to disclose real dangers.

In general the greatest safeguard in coral navigation is the remarkable clearness of the water, enabling a good look-out aloft to discover sunken reefs in time to avoid them; but upon this coast—whether from its being

discoloured by the immense quantity of mud deposited by the rivers or from some other cause—these waters are not so transparent as those about the reefs of Torres strait and the east coast of Australia.

Between the sunken Barrier and the mainland, from South cape to Blanchard island, the space was not closely sounded; but with the exception of a 9-fathoms coral patch, at $4\frac{1}{2}$ miles south-westward of Arch islands, the soundings were tolerably regular, being from 18 to 43 fathoms.

OWEN STANLEY RANGE extends from mount Thomson E. by S. $\frac{1}{2}$ S., gradually decreasing in height, for about 26 miles, there is then an apparent break for about 8 miles; it then gradually rises again and extends to the south-east extreme of the island, close over which it attains a height of 1,800 feet.

The country between Owen Stanley range and the shore, from Orangerie bay to Heath island, was so hidden by Cloudy mountain, and the lofty coast ranges east and westward of it, that no other account of it can be given, except that there appeared to be a considerable tract of low land extending towards the back of Cloudy mountain from Orangerie bay; and what could be seen farther to the eastward seemed hilly and sterile.

CHINA STRAIT, dividing the south-east part of New Guinea from Hayter island, is about 4 miles long N.E. by N. and S.W. by S., by rather more than three-quarters of a mile wide in its narrowest part. Captain Moresby, H.M.S. *Basilisk*, in his explorations in 1873 considered that this strait might afford a shorter route to China, hence its name: upon further examination, however, it was found that the intricacy of the navigation to the north-eastward of the strait, caused by many obstructing reefs, was so great as to render preferable the route some 25 miles farther east. The depths in China strait vary from 24 fathoms, sandy bottom, eastward of, and between Dinuer islet and Hayter island, to 18 fathoms, mud, abreast Scramble point.

The only danger noted in a cursory examination was a 4-fathoms patch, about half a cable westward of Steep point. A sunken rock (*China rock*) which seldom breaks, is reported to lie in the northern part of this strait, with Paples island bearing S.S.W., distant $1\frac{1}{2}$ miles, and the centre of Didymus island S.E. $\frac{3}{4}$ S., distant 2 miles.

China strait, the navigation of which is better suited for steam than sailing vessels, may be entered either to the eastward or westward of Heath island. H.M.S. *Basilisk* passed through both channels, but the eastern entrance is recommended, as it apparently commands a clear passage when approaching from the southward. No shoals could be seen in very clear weather from the masthead of the *Basilisk*, and when a vessel is

to the northward of Blanchard island, it is considered no danger need be apprehended.

From the point abreast Coast island, the coast of New Guinea trends north-east for $2\frac{1}{2}$ miles, after which it gradually curves round N. by W. to North Foreland, and has but slight indentations; it is bold and thickly wooded, rising in steep inclines from the water's edge to a height of about 1,500 feet, with deep ravines, which become more extensive and marked as North Foreland is approached. Depths of 24 fathoms coral were found at a distance of about $1\frac{1}{2}$ miles from the shore, but this can afford no criterion to the surrounding soundings, which are probably much deeper. A 4-fathoms coral patch lies about a mile S.E. by E. of North Foreland, and discoloured water, having an apparent depth of about 4 fathoms, lies about $1\frac{1}{2}$ miles E. by N. $\frac{3}{4}$ N. of the same headland; the position of the latter danger is doubtful.

Water.—On the western shore of China strait there is abundance of water easily procurable by vessels.

Coast, Middle, and Dinner Islets are small, similar in appearance, and situated at the south-west entrance to China strait. Coast islet, about 300 feet high, is the highest of the three, and lies in the mouth of a small bight of the mainland. Dinner islet is nearly mid-channel between Hayter and Heath islands, the summit is near its northern end, and there is a small sand-beach on its north-east side. Middle islet is equidistant from Coast and Dinner islets, resembling the latter in appearance, and bearing from it N.N.W., distant 9 cables. All are thickly wooded, and fringed by coral reefs. About $1\frac{1}{4}$ miles westward of Middle islet is a bank which dries at low water, there is also another a little farther to the westward, both these banks are in the middle of the channel between the north end of Heath island and the main.

HAYTER ISLAND is irregular in shape, and nearly 5 miles long in an E.S.E. and W.N.W. direction, by from a half to $2\frac{1}{2}$ miles broad. Its northern shores are deeply indented, but without villages, the inhabited parts being on the west and south-west sides.

Mount Haines, the summit of Hayter island, is conspicuous, regular in outline, and of bluntly conical shape, rising near the south-west extremity, cultivation (yam and taro plantations) is carried on almost to its summit (about 900 feet), and from it the other ridges of the island radiate.

Possession Bay lies on the north-west side of Hayter island, and is so named from Captain Moresby having here taken possession in the name of the Her Majesty the Queen; it is about one mile long, 700 yards deep, and affords safe anchorage out of the influence of the tides of China strait, but is somewhat difficult for a sailing vessel to approach. The want of sand-beach, the mangrove swamp which lines the greater part of

the bay, and its land-locked position causing an absence of sea breeze, all tend to make it unattractive, when compared with other anchorages in Moresby island, to the eastward.*

A village is situated in the small bay next South of Steep-point: from it were brought small supplies of turtle, fish, yams, cocoa-nuts, bananas, and pigs (bartered for iron-hoop). Water can be procured at a well 12 feet deep, dug by the crew of H.M.S. *Basilisk*, at 200 yards distance inland, and near the bed of a mountain torrent, but the water was found by H.M.S. *Sandfly* to be of inferior quality. In the pools of this torrent is a small fish similar to a trout.

Anchorage may be found in about 12 fathoms, mud, 3 cables from the shore.

Tides.—It is high water, full and change, in Possession bay at 8h.; springs rise about 5 feet, and neaps $2\frac{1}{2}$ feet. The stream of flood sets to the northward, and that of ebb to the southward, following the direction of the strait, and attaining at springs a velocity of 5 knots an hour. In-shore on the eastern side of the strait, there is at times an eddy tide setting in the opposite direction to that of the tide in the centre of the strait. It appeared from observations extending over a period of fourteen days, that although there was a constant change in the time of high water, yet the time of low water was always at about 3h. p.m. The direction, strength, and duration of the wind appeared to have a marked effect upon the tides.

The Coast from Steep point, the south extremity of Possession bay, to the southward forms a small bay with a narrow sand-beach, 6 cables across, in which is the village just mentioned. An elbow projects from the south side of this bay, off which, and nearly joined to it, is a small thickly wooded islet. Continuing to the S. by E. for a mile, to a point with a flat of rocks off it, the coast suddenly bends to the E.S.E. $1\frac{1}{4}$ miles to Peninsula point, which is a small wooded projection, appearing like an islet, but joined to the shore by a narrow neck of sand. Nearly 4 cables N.W. $\frac{1}{4}$ N. of Peninsula point is a rock about 6 feet above water; and immediately westward of the same point is a small bay, which extends 2 cables in northerly direction.

The coast then continues in an E.S.E. direction for $2\frac{1}{4}$ miles to the south point of Hayter island, and has two small bays between. Off this point, distant $1\frac{1}{2}$ cables, is Bead islet—small, round, and thickly wooded. A ledge of sunken rocks extending 4 cables from its western side, and parallel to the shore, terminates in a flat-topped rock about 6 feet above water. From Bead islet to Rocky pass the coast trends E. by N. for 9 cables, and then turns sharply to the west, forming the eastern of four small rocky bays,

* See plan on Admiralty chart, No. 2,123; scale, $m = 4$ inches.

which are separated by narrow projecting points, thickly wooded, but apparently destitute of cultivation or inhabitants. These bays form the northern shore of Hayter island ; the west point of the western bay being Scramble point (the north point of Possession bay).

Mekinley Island, on the east side of China strait, and near its northern end, is about 200 feet high, and affords a mark by which to detect the strait, if approaching from the northward.

Paples Island lies half a mile to the eastward of Mekinley island. It is about 250 feet high, thickly wooded, of oval shape, and a coral reef extends from its shores to the distance of a cable. Soundings of 19 fathoms, muddy bottom, were obtained at half a mile E. by N. from its south point, and no bottom at 30 fathoms, midway between it and Didymus island. There are no inhabitants nor signs of cultivation upon Paples island.

Button, Brewer, and Head Islets.—Between Paples island and Scramble point (of Hayter island) is a small islet covered with grass, termed Button islet, bearing from the latter point N.E. by E. $\frac{1}{2}$ E., distant 8 cables. There appears to be a channel between it and Scramble point of 13 fathoms of water. Brewer and Head islets are similar to each other in size and appearance, being about 800 yards long, East and West, by 400 yards broad. Both are high and thickly wooded, with round summits. They bear East from Scramble point, distant about 6 cables, and $1\frac{1}{2}$ miles respectively.

Didymus Island, about $1\frac{1}{4}$ miles long by half a mile in breadth, is situated $1\frac{1}{2}$ miles eastward of Paples island. It is deeply indented on its north-west and south-west sides, and rises to three irregular peaks, the highest of which is about 350 feet above the level of the sea. The shores of this island are for the most part of mangrove swamp, but a small sand-beach affords difficult landing on the north-east side. A belt of coral surrounds it, and extends in a curve to a distance of three-quarters of a mile to the north-east. There are no cocoa-nut trees, and the underwood is so thick as to be almost impenetrable. No signs of natives were seen, nor is there anything to tempt them to visit its shores.

Rocky Pass is a narrow channel or gut, separating Hayter island from Basilisk island. It is about three-quarters of a mile long in a general north-west direction, estimated at 130 yards wide at its narrowest part, and has $3\frac{1}{2}$ fathoms near mid-channel between the two islands. Dot islet, a small round rock covered with trees, is situated nearly mid-channel in the northern part of the pass.

The tides run with great strength through the pass, with a heavy overfall to the southward. The pass is not navigable for ships, but a well-manned boat may use it except during strong south-east winds.

BASILISK ISLAND to the eastward of Hayter island, forms three sides of a hollow square open to the west; of these the northern is higher, broader, and more irregular in outline than the other two. The island is $8\frac{1}{4}$ miles long East and West, by $7\frac{1}{4}$ miles North and South, and varies in breadth from a half to $3\frac{1}{2}$ miles. The land rises to a narrow thickly wooded ridge of hills throughout its entire length and breadth, averaging from 300 to 900 feet in height. In the southern portion, this ridge narrows and dips in one or two places to about 100 feet, as it extends north along the eastern part of the island it gradually increases in altitude, until the summit, mount Goodman, is reached, where it attains a height of probably 900 feet.

Only one village was noticed, and that was in the north-east part near Carry island, the soil appearing ill-adapted for cultivation. Eastward from the south-west point of Basilisk island the coast forms a bay nearly three-quarters of a mile deep, with steep rocky shores.

Jenkins bay.—This large bay is formed by Hayter island on the west and Basilisk island on the south, east, and north. It contains numerous shoal patches, the positions of which are uncertain, and the bay has no known anchorage. A few scattered cocoa-nut trees were seen upon its shores, but no villages, canoes, or signs of habitation.

West Islet, nearly a cable from the north-west point of Jenkins bay, is small, about 200 feet high, thickly wooded, and fringed by a coral reef. Useless islets, two in number, are small, and thickly wooded. They are situated in the north-east part of Jenkins bay, but were neither visited nor examined closely.

The south coast of Basilisk island continues from Razor point in an easterly direction for 6 miles to its south-east point, being for the most part bold, and having a depth of 17 fathoms to within one third of a mile from the shore. A ledge of rocks, which dry at low water, and continually break, extend about a cable to the southward of a point $2\frac{1}{2}$ miles eastward of Razor islets. About a mile westward of the south-east point of Basilisk island the steep nature of the coast ceases, and a ledge of coral reef with boulder rocks, which dry at low water, extends rather more than a cable to the southward.

Razor Islets, two in number, about 200 feet high, are small, rocky, and sharp ridged, with some small trees and scrub on their summits. They are the continuation of a wedge-like point (Razor) of the same description, which juts out in a south-easterly direction. The southern, or outer one, bears S.E. by E. 3 miles from the south-west point of Basilisk island. In fine weather there is a boat passage approximately a cable wide between the islets and the point.

Margaret Island, half a mile South of the south-east point of Basilisk island, is $1\frac{1}{2}$ miles long, East and West, half a mile broad, and about 500 feet high, with rather a level, thickly-wooded summit. There is a village on its south shore, constantly resorted to by the natives of the neighbouring islands. The channel between Margaret and Basilisk islands, estimated at half a mile wide, is narrowed by the shore reef from the latter. It has from 7 to 20 fathoms of water, the bottom being irregular, and of a sand and coral nature. At spring tides the stream runs strong through this channel, which should not be attempted by a sailing vessel unless with a commanding wind and at slack water; it is advisable to keep nearer to the Margaret island shore in passing through.

From the south-east point of Basilisk island the coast trends to the northward at right angles to its former trend, forming the western shore of Fortescue strait, and for a mile continues fringed to the distance of about a cable by coral reef, after which, a bight, 2 miles long by three-quarters of a mile deep, occurs. The shores of this bight are lined with mangrove swamp, and the ridge of hills at the back increase in altitude, being at this part about 600 feet high. Thence for 3 miles to Goodman point, off which are several shoals extending to the eastward, the coast continues its northerly trend, having two small bays with a salient intervening point, off which is Carry island. The southern bay has an extensive shore reef, but anchorage may be found South of Carry island in 13 fathoms. H.M.S. *Basilisk*, whilst looking for a passage through Fortescue strait, remained in this anchorage a few days, and procured an abundant supply of yams from the natives. The northern bay has not been examined, but a dangerous shoal fronts the entrance.

The only village seen on Basilisk island was in the northern part of this bay, about three-quarters of a mile South of Goodman point. The natives here were friendly, wading out waist deep with cocoa-nuts and yams, being urged by the women on the beach to exert themselves in procuring hoop-iron and hatchets in exchange.

From Goodman point to Negro head the coast extends N.W. by W. for $2\frac{1}{4}$ miles, and has two shallow bays separated by a rocky point. Soundings of from 7 to 9 fathoms were found at 2 cables from the shore, but about $1\frac{1}{2}$ miles to the northward breakers could be distinctly seen upon the extensive reef, which stretches eastward for $3\frac{1}{2}$ miles from Negro head.

Negro Head, the north point of Basilisk island, is well defined, thickly wooded, and surrounded by a coral reef which extends about 2 cables to the north, half a mile to the west, $3\frac{1}{2}$ miles to the eastward, and forms a natural breakwater to the north-east part of Basilisk island. The reef has numerous boulder rocks above water, and dry coral patches. Eastward of the reef, the ground continues foul and more or less broken

the whole distance to Shortland islet, and to the sunken coral patches off the north coast of Moresby island.

Challis Head is 4 miles W. $\frac{3}{4}$ S. of Negro head, and, like the former, has a shore reef of coral, which extends only one quarter of a mile from it on all sides. Between these two heads is Foul bay, probably 2 miles deep. It was not closely examined, but had the appearance of containing shoal water, and no signs of habitation were seen on its shores.

Mount Goodman, the highest peak in Basilisk island, rises to an altitude of about 900 feet, at the distance of rather more than a mile S.W. by W. $\frac{1}{2}$ W. from the point of the same name. When seen from the north-east it appears sharp with a round shoulder on its western side, but from the southward it is difficult to distinguish from the surrounding peaks by which it is sometimes hidden. It is thickly wooded from the summit to the water's edge with trees of dark green foliage, as is the whole of Basilisk island.

Rat and Mouse Islets, lying north-east and south-west of each other, are small, $1\frac{1}{2}$ cables apart, about 50 and 30 feet high, thickly wooded, and have small sand-beaches. Coral reefs extend from their south-west sides to the distance of about a cable. Rat, the larger of the two islets, is $2\frac{3}{4}$ miles northward of the south entrance of Fortescue strait, and about half a mile from the shore of Basilisk island. There appears to be deep water between the islets.

Carry Island is crescent-shaped, about 300 feet high, and nearly a mile long, N.E. and S.W., by one quarter of a mile in breadth. Its south point is $1\frac{1}{4}$ miles North of Mouse islet. A projecting point of Basilisk island is separated by a channel, about a cable wide, from its western point. A narrow strip of coral sand-beach surrounds Carry island, and a reef, awash at low water, borders the shore. The island is thickly wooded, there are no cocoa-nut trees, and a tangled undergrowth, breast high, exists throughout.

FORTESCUE STRAIT separates Basilisk from Moresby island, and is about 2 cables broad at its southern end, opening out in bell-like shape to a width of $1\frac{1}{2}$ miles at the northern. The south entrance is deep and narrow, but the shoal water extending east of Goodman point appears at first sight to effectually block up the approaches from the northward. Mid-channel between the south-east point of Basilisk island and the south-west point of Moresby island are soundings of 19 fathoms, continuing for about a mile to the northward; at a quarter of a mile East of Rat and Mouse islets, 16 fathoms sand; at three-quarters of a mile eastward of Carry island, and nearly mid-channel, 22 fathoms, with the same bottom; after which a sand-bank, which dries about 4 feet, is situated E. $\frac{3}{4}$ N. nearly $1\frac{1}{2}$ miles distant from Goodman point, and patches of coral having depths

of 3 and 4 fathoms lie scattered in the space between this sand-bank and the north shore of Moresby island, for the position of which shoals the chart is the best guide.

The south-west point of Moresby island is of moderate height, and steep-to on its western side, but a reef extends from it to Pigeon islet.

The eastern side of the narrows of Fortescue strait extends N. by W. $\frac{1}{4}$ W. $1\frac{1}{2}$ miles from the south-west point of Moresby island, and is bold, steep-to, and thickly wooded to the water's edge. The west coast of Moresby island thence to White point (the north-east point of Fortescue strait) is bordered by mangrove swamps, and is without villages. A small islet covered with trees, and hardly discernible from seaward, nearly joins the shore at $1\frac{1}{4}$ miles to the south-west of White point. A bight about half a mile deep extends in a southerly direction, immediately south of White point, and is divided from a similar bight by a point, from which a small coral reef projects.

MORESBY ISLAND.—The western shores of this island form the eastern boundary of Fortescue strait as just described. Moresby island is 10 miles long, East and West, and has an average breadth of $3\frac{1}{2}$ miles. The higher grounds, including Fairfax ridge, are covered with a thick forest of tropical trees; this ridge forms the back-bone of the island, its highest part culminating in three well-defined peaks, of which mount Fairfax, the highest, has a peculiar knob-shaped summit by which it may be recognized; it is 1,340 feet above the level of the sea, and conspicuous from all directions.

The island is thickly inhabited and extensively cultivated, the sides of the highest peaks being covered with yam and taro plantations; the valleys produce bananas, oranges, sago, betel nut, sugar cane, Indian corn, and other tropical fruit.

Although abundance of water exists on the island, and in some of the streams fresh-water fish, yet no place was found where a vessel could obtain water, the shores being fringed with mangrove swamps in which the streams are absorbed before they reach the sea.

There are many deep bights and indentations, two of which—Hoop-iron and Pitt bays—afford secure anchorage.

Pigeon Islet, is a small conical islet, covered with trees and long grass, the summit being about 60 feet high. It lies one quarter of a mile from the south-west point of Moresby island, to which it is connected by a sunken reef, having upon it a small sand-bank which dries at low water. Boulder rocks surround the island, and extend a cable from its south-east side; landing is difficult. Flocks of large white pigeons resort here to roost.

O'Neill island, a little to the eastward of Pigeon islet, is $1\frac{1}{4}$ miles long, N.W. and S.E., by three-quarters of a mile broad, and is separated from the south-west peninsula of Moresby island by a channel one quarter of a mile wide, through which the tide sets with considerable strength. The island is hilly, the summit being about 580 feet above the sea, and upon the level grass-grown ridge extending to the south-east, is a large tree with dark foliage which affords an excellent mark from the southward. A similar tree, but smaller, is situated on a lower part of the same ridge, but only shows out when seen from the eastward.

The principal village of O'Neill island is in a small bay on the north-east side, off which the *Basilisk* anchored in 15 fathoms. This anchorage is somewhat exposed during the S.E. monsoon.

The northern shore of the passage dividing O'Neill island from Moresby island, takes an E.N.E. direction from the south-west point of Moresby island, and is fringed with coral reef extending a cable from the shore, for a distance of $1\frac{1}{4}$ miles, when the small jutting peninsula, called Observation point (on the west side of Hoop-iron bay), is reached.

Hoop-iron Bay, so called on account of the great demand for that article evinced by the natives, is situated on the south-west side of Moresby island. The land surrounding the bay varies in height, from about 1,200 feet at Double peak over Green point on the east side, to 400 feet at Smooth Green peak on the west. To the eastward, the hill sides are broken up into numerous ravines and spurs thickly clothed with trees. A decided gap takes place in the ridge near the centre of the bay, immediately eastward of Grassy point; a valley which extends the entire breadth of Moresby island, from North to South, at this place being crossed by the southern range of hills.

The natives were numerous in the many villages round Hoop-iron bay, and at O'Neill island. A few pigs, yams, cocoa-nuts, &c. were here procured, and among other curiosities, models of their large canoes, skilfully executed, and coloured with red and white pigment.

Anchorage.—Hoop-iron bay affords good anchorage, protected from all winds except those blowing from East to S.S.E.: a good berth will be found in about 13 fathoms, over a bottom of stiff dark mud, with Observation point bearing South, distant 3 cables. This position is out of the influence of the tide, and well sheltered by O'Neill island which lies to the southward.

Green Point may be termed the eastern point of Hoop-iron bay, although the coast continues to trend in an easterly direction, curving round gradually to the southward, to Rocky point.

Rocky Point is 3 miles S.E. by E. $\frac{1}{4}$ E. from Green point, and between are five small sandy bays, separated by rocky points. A rock

awash, upon which the sea generally breaks, lies E.S.E. $1\frac{1}{2}$ miles from Green point, and about half a mile from the coast.

Rocky Islet lies S.E. $\frac{1}{2}$ S. southerly $2\frac{1}{2}$ miles from Green point, and W. by S. $\frac{1}{2}$ S. a little more than a mile from Rocky point; it is a dark coloured rock, with a thin covering of grass upon its summit. It appears to be steep-to on all sides, and there is a good channel, through which the *Basilisk* passed, between the islet and Moresby island.

From Rocky point eastward the coast forms a bight about half a mile deep, with three small sandy beaches, separated by rocky heads, for $1\frac{1}{2}$ miles to South point, which bears from Rocky point E. by S. South point is a well-defined bluff, terminating the south-east ridge of the high land of Moresby island.

From South point the coast trends N.E. $\frac{1}{2}$ E., rocky and steep, for a mile, to a prominent point which forms the southern boundary of James bay, and which almost joins Haines island to Moresby island.

James Bay, the approaches to which are very confined, has tolerably good anchorage. It is estimated to be a mile deep in a westerly direction by half a mile wide. A coral reef borders the northern shore to the distance of $1\frac{1}{2}$ cables, and a bamboo pole was seen fixed on its southern edge, apparently as a guide to the larger canoes in entering. A flat lizard-shaped reef of rocks, which dry at low water, about half a mile in length, north-east and south-west, extends parallel to the shore northward of the north-east point of the bay; foul ground continues to within about a mile South of Emerald point.

Haines Island has a saddle-shaped summit, the two peaks of which rise to a height of about 250 feet. They are steep and clothed with trees on the western side, but show a grassy slope to the eastward. The island is nearly one mile long W.N.W. and E.S.E. and one quarter of a mile broad; foul ground extends to the distance of a cable from its northern shore. A small round islet, with bushes upon it, is connected by coral reef with the north west point of Haines island; and there is a narrow boat channel, through which the tide runs with great rapidity, between this islet and the south-east point of James bay.

Connor Island is shaped like a triangle, the apex being to the north, and each side $1\frac{1}{2}$ miles in length. It has three peaks about 430 feet high near its centre, and is well wooded throughout. The north-west side of the island is steep, and on the north-east is an extensive village with cultivation. The south-east point terminates in a small pyramid-shaped rock, almost detached, which appears remarkably white when the sun shines upon it.

The channel between Connor island and Haines and Moresby islands, about a mile in width, has depths of 29 and 24 fathoms. H.M.S. *Basilisk* passed through at spring tides, and the rate of the tide was estimated at

3½ knots. A black-headed rock, showing at half tide, is situated in the channel, between Emerald point (Moresby island) and the north point of Connor island; from the rock, Emerald point bears N.W. by W. ½ W., distant 4 cables, and the north point of Connor island E. by N. 1¼ miles. The rock is steep to all round. The channel eastward of it is recommended.

Glenton Island three-quarters of a mile long North and South and one quarter of a mile broad, is of regular shape, and rises to a thickly wooded and well-defined peak, 390 feet high. Crowning the summit is a large tree, which has been rendered conspicuous for some time to come, by having had the surrounding wood cleared away, to make a mark for surveying purposes. The northern part of the island is flat, and of coral formation, having a small sand-beach. A few cocoa-nut trees grow here, apparently the property of the natives of Connor island, who were seen to visit it. Ledges of rocks extend from all its sides except the south. A depth of 20 fathoms, over a bottom of coarse sand, was found between the western rocks and Connor island.

Smith Islet is small, low, thickly wooded, and uninhabited. A coral reef connects it with the east side of Glenton island, from which it is about one quarter of a mile distant, and a ledge of black rocks extends a cable from the southern extremity of the islet. Soundings of 21 fathoms, coral bottom, were found half a mile to the north-eastward of the islet, and 15 fathoms between it and Maben islet (to the north-westward).

The route to Goschen strait, when approaching from the southward, leads about a mile eastward of Smith islet, but Glenton island, being higher, with a well-defined peak surmounted by a remarkable tree, will be seen and recognised before the low land of Smith islet becomes visible from the deck.

Aspect.—The navigator viewing Hayter island and the other islands eastward of it, from a distance of 20 or 25 miles, might suppose that as far east as Smith islet the land from the south-east point of New Guinea was continuous; China and Fortescue straits being shut in, and the channels between Smith, Connor, and Moresby islands having the appearance of dips in a range of hills; and this would account for the error fallen into by former explorers in so describing it, for what was formerly considered to be the south-east cape of New Guinea is almost identical in geographical position with Smith islet.*

* On this D'Urville observes, "To the north of this archipelago (Teste, Lebrun, Dumoulin, Brumer, Blanchard, Leocadie, &c.) the coast presents a series of peaks rising above elevated land, and probably forms part of New Guinea. All the coast between cape South-east and Orangerie bay is so indented that in all probability it is formed by a multitude of high islands separated by narrow straits."—*Voyage au pôle sud sur L'Astrolabe et La Zélée; sous le commandement de M. J. Dumont D'Urville, 1837-40. Tome deuxième, p. 212. Paris, 1851.*

Tides.—It is high water, full and change, in Fortescue strait at 8h.; springs rise from 4 to 5 feet. The flood stream sets to the north, and ebb to the south; at springs the tidal streams set at the rate of 5 knots in the narrow part of the strait.

The approximate time of high water, full and change, at Hoop-iron bay is 8h. 30m.; springs rise about 5 feet. In the channel between O'Neill and Moresby islands, the flood tide sets to the westward, ebb to the eastward. Many tide rips and eddies occur in this vicinity at springs, when the tides attain a velocity of more than 4 miles.

In the channels between Smith islet, and Moresby island, the tides run at the of 4 or 5 knots an hour.

Maben Islet, about a mile E.N.E. of the north point of Connor island, is oval in shape, and half a mile in length, N.W. and S.E. It is low, thickly wooded, and surrounded by a strip of sandy beach, inside which is a small salt-water lagoon. The northern side of the island is steep-to, but a coral ledge extends 3 cables south-east of its southern point.

In the channel, between Maben and Connor islands, is a sunken coral patch, having 18 feet water. To the north and south of this position are 27 and 20 fathoms; but this channel being insufficiently sounded should be used with extreme caution.

Pitt Bay is the largest indentation on the east side of Moresby island, being $1\frac{1}{4}$ miles long North and South, by about the same distance in depth. Three bright green bluffs, about 60 feet high, similar in appearance, caused by an absence of trees leaving the rich grass exposed in such a manner as to appear artificial, are a remarkable feature in the bay. Fairfax ridge, near the centre and at the back of the bay, here rises to the height of upwards of 1,200 feet, and dividing into a fork, extends north-eastward in a ridge of from 900 to 500 feet high to Can-buoy point, and south-westward in a more gradual slope, with a solitary remarkable peak towards Emerald point.

A low flat islet, separated from Moresby island by a narrow channel, is situated on the south-east side of Pitt bay. This channel is navigable for small boats at high water only, and its entrance is difficult to discern from seaward. On the eastern side of this islet are two more of the remarkable green bluffs before alluded to—to the northern one of which the name of Emerald point has been given.

The northern point of Pitt bay is well marked by a conical brown rock situated on the fringing reef, and about 20 feet high; the rock resembles a can-buoy in appearance, and gives its name to the point. The depths in the centre of the bay vary from 13 to 22 fathoms, sand and coral, but in a line from the south-west corner to Can-buoy point, are four coral knolls, having depths of 6 to 13 feet, and forming a broken chain, to the northward of which are soundings of 9 and 10 fathoms. The coast of this bay

is generally fringed with coral reef, extending from the southern shore three-quarters of a cable.

Anchorage.—The *Basilisk* anchored in 12 fathoms, white sandy bottom, with the Inner Green bluff bearing S.E., distant 3 cables; and Can-buoy rock N.E. $\frac{1}{2}$ N., 2 miles nearly.

DIRECTIONS.—In entering Pitt bay the southern shore should be kept at the distance of about half a mile, until the Inner Green bluff bears S.E., which is as far in as a vessel should go. In the south-east monsoon it is probable that considerable sea enters this bay. Sandfly bay in Skelton island, or Flinn bay on the north coast of Moresby island, will at that season be found preferable.

Supplies.—Water may be found in the small bight in the north-west part of the bay, and also in the south-west bight, but so far from the beach as to be inconvenient for conveyance to ships boats except in casks.

Natives were seen in great numbers in Pitt bay, coming from all parts of Moresby island, and from the islands to the eastward, in large canoes, having oval-shaped sails, made of matting. Pigs, yams, taro, arrowroot, and bananas were procured for hoop-iron and red handkerchiefs. As many as 50 large canoes, each capable of holding 40 or 50 men, were sometimes around the *Basilisk* at one time. In light winds these craft sail very swiftly, and are steered from either end by a large paddle.

The Coast of Moresby island from Can-buoy point trends N.N.W. for nearly $1\frac{1}{4}$ miles to cape Lookout. The north-east arm of Fairfax ridge has a succession of regular conical peaks, gradually decreasing in height as cape Lookout is approached, and remarkable when viewed from the north-west or south-east. Between Can-buoy point and cape Lookout are two small irregular bights, with projecting elbows, of large shingle and rocks, enclosing water-space. The southern is blocked with coral reef, but the northern affords a good boat harbour. Also, on this part of the coast is another of the bright green knolls, for which Pitt bay, as already mentioned, is peculiar.

Flinn Bay.—From cape Lookout the coast trends West for three-quarters of a mile, with a small indentation, after which Flinn bay forms a double bight $1\frac{1}{4}$ miles deep, to North point.

Pitt Islet.—In a line between North point and cape Lookout, but rather nearer to the latter, is Pitt islet, almost joined to a tongue of land which divides the two arms of Flinn bay. The islet is small, low, and covered with trees, to which bush-turkey and pigeons resort. It is encircled by a coral reef, and has two sand-banks above water, with bushes upon them, on its eastern side. Between the south point of the reef surrounding it, and the dividing point of Flinn bay, is a narrow channel, having 5 to 7 fathoms water. From the north point of the reef of Pitt islet, cape

Lookout bears E. by S. $\frac{1}{4}$ S., distant 6 cables, and the centre of Grant islet N. by W. $\frac{1}{4}$ W., distant nearly 2 miles.

A sunken danger, on which there is a depth 3 fathoms, lies at two-thirds of a mile off the north side of Moresby island, with cape Lookout bearing S. 39° E. distant one mile, and Pitt island S. 59° W., distant three quarters of a mile.

Anchorage may be found in 16 fathoms, mud, in the eastern arm of Flinn bay, with the centre of Pitt islet bearing N. by W. $\frac{1}{4}$ W., and Shortland islet seen just clear of the north point of entrance. Caution is requisite in rounding the north point, when entering this bight, as a coral ledge, rather difficult to detect, extends seaward from the point more than half a cable, and is steep-to.

Water was found at the head of the bight, but it was not practicable to obtain it in bulk in ships' boats, owing to the shallowness of the water, and its distance inland. Small casks might be filled, and brought off.

South-westward of Pitt islet is the western arm of Flinn bay, about $1\frac{1}{4}$ miles deep, and affording good anchorage in the N.W. monsoon in 14 to 16 fathoms, mud. A coral ledge extends a cable off the projecting point, which is situated to the south-west of North point, otherwise this bight of Flinn bay appeared clear of danger.

North Point, Moresby island, is salient, clear of trees, and covered with long grass. It bears W. by N. $2\frac{1}{4}$ miles from cape Lookout, and has a small coral reef extending from it.

The Coast.—To the westward of North point are two small bays, and westward again Mudge bay, about a mile deep in a southerly direction, and half a mile broad at the entrance. A small stream flows into the head of Mudge bay, immediately eastward of the village, but it is so barred, as to prevent the entrance of any except the smallest canoes.

The western entrance point of Mudge bay, bears W. by S. $\frac{3}{4}$ S. $1\frac{3}{4}$ miles from North point. A coral ledge extends a cable to the northward from the point, upon which were seen abundance of *bêche-de-mer* (sea-slugs) of large size. After passing this point the coast takes a W. by S. $\frac{1}{2}$ S. direction, and consists of a series of small shallow bays, the shores of which are girt by a narrow strip of coral reef. Several coral patches of 2 to 3 fathoms with deep water around them, lie from half to $1\frac{1}{4}$ miles off the coast between Mudge bay and White point.

Anchorage may be found in Mudge bay in 11 fathoms, sand and mud, well protected except from northerly winds.

Water is procurable at a stream which flows into the sea at about two miles westward of Mudge bay. There is a village on the western bank, and room for a boat inside; but the entrance being barred, high water should be chosen for entering and leaving. The water will be found

fresh and sweet, about 120 yards inside the bar. The natives here are friendly.

White Point, about $4\frac{1}{2}$ miles westward of Mudge bay, is the north-eastern point of entrance to Fortescue strait. A small belt of dead coral and sand shows white against the dark mangrove foliage behind, and marks the position of the point. A small stream and village are situated about three-quarters of a mile eastward of the point; the valley, which here runs to the south, divides the high land of Moresby island into two parts, as far as the gap in the ridge surrounding Hoop-iron bay.

Grant Islet bears N.W. $\frac{1}{2}$ N. 3 miles from cape Lookout, and N.N.E. $1\frac{1}{4}$ miles from North point (Moresby island). It is low, of coral formation, with a small sand-beach, and surrounded by coral reef to the distance of one quarter of a mile. The higher portion is covered by open trees, and takes the shape of a crescent, the convex side of the curve being to the eastward. A small detached sand patch, covered with bushes, is situated on the south-west side of the reef, about a cable from the islet; and to the westward of it, discoloured water, in which soundings of 4 and 5 fathoms were obtained, was seen stretching for a considerable distance towards Goodman point (Basilisk island), and the northern shore of Moresby island.

Shortland Islet and Reefs.—The islet, about one-third of a mile in extent, and of oval shape, bears N.E. by E. $2\frac{3}{4}$ miles from Grant islet. It is about 200 feet high, and the trees upon it are higher and more dense than those of Grant or Byron islets. Encircling Shortland islet are coral reefs, extending on the western side to the distance of half a mile, and to the eastward in an angular horse-shoe shape, for nearly $3\frac{1}{2}$ miles, then, curving to the southward, and almost joining Byron islet. It is possible for a boat to thread her way through the breaks in the reefs, but the passages are very intricate. Upon the reefs there is an occasional dry sand-patch, with a few bushes and scrub growing upon it.

Between Shortland and Grant islets there is a passage $2\frac{1}{2}$ miles wide, but narrowed by the reef of both islets and a detached 5-fathoms patch, to $1\frac{1}{2}$ miles. On the south side of a line joining these islets, depths of 25 and 34 fathoms were found increasing suddenly to 57 fathoms, with no bottom on the north side. A heavy tide race is almost always to be seen here. The steam pinnacle of H.M.S. *Basilisk*, in passing through, had her fires extinguished by the irregular broken sea, and none but a steam vessel, or a sailing vessel with a commanding breeze, should attempt this passage. Pigeons and bush-turkeys appeared to be numerous on Shortland islet.

Byron Islet forms a triangle with Grant and Shortland islets, and marks well the southern extremity of Shortland reefs. In appearance it is much like Grant islet, the trees being thinner and of less height than those of Shortland islet. A small sand-beach surrounds Byron islet, and coral ledges extend about a cable from its east and west points.

This islet is the last included among the islands of New Guinea proper. The south-east coast of New Guinea from the North Foreland to East cape will next be described.

NORTH FORELAND is a steep, bluff, rounded, headland, forming the north-east point of the southern prong of the fish-tail, to which the eastern part of New Guinea may be likened. To the westward of it, the coast forming the southern shore of Milne bay continues bold and steep, and is slightly indented by a succession of small bays, which have not been minutely examined. Small cascades of fresh water abound in this part.

Spike Island lies about $1\frac{1}{4}$ miles north-westward of the round of the North Foreland; it is low and woody, and approximately a mile long, N.W. and S.E. A coral reef surrounds it, and connects it with the shore reef of the mainland; through the shore reef there is a narrow boat channel.

Anchorage.—A vessel may, during the south-east monsoon, find a snug anchorage off the western end of Spike island. H.M.S. *Basilisk* anchored off the south shore of Milne bay in 14 fathoms, about 3 miles westward of Spike island; and H.M.S. *Sandfly*, in 1874, anchored in the same vicinity, and replenished with excellent water.

MILNE BAY, which separates the north-east and south-east arms of the eastern part of New Guinea, extends in a westerly direction, and is about 25 miles deep, with an average breadth of 8 miles. The Owen Stanley range, which may be called the backbone of eastern New Guinea, terminates at the head of the bay; running parallel to this range, and separated by extensive valleys, is the Stirling range of mountains. There are numerous villages, and much cultivation on the southern shore of Milne bay. The water here is very deep—no bottom with 200 fathoms of line being found about half way into the bay, and 4 miles distant from either shore. No bottom could be found with 30 fathoms at a few yards from the beach, but in the small bays anchorage may be had in 15 or 20 fathoms, with sufficient room for a vessel to swing clear of the rocks. At the head of the bay, a thickly populated plain extends 4 or 5 miles inland to a low mountain range, which lies in a North and South direction.

Water may be obtained at numerous places on the south side of Milne bay, westward of Spike island.

Discovery Bay is situated about 15 miles westward of Spike island. This snug anchorage is situated on the south shore of Milne bay, 5 miles from the head of the latter. Coming from seaward the eastern part appears low and wooded, and the bright green hills in the back-ground show its vicinity; on nearer approach, the anchorage is distinctly marked by a reef above water, with several small islets and one small bush on it. The entrance lies between this reef and Surprise point, the north-east extremity of the bay. Vessels should keep the eastern bight of the cove on board, as the shore there is steep-to, 8 fathoms being found within a few yards of the beach, whilst the western side has an extensive shore reef, not always discernible.*

Supplies.—The water which runs through the village is not fit for use, but round either the east or west points of the bay an abundance may be obtained. Pigs, yams, and many varieties of tropical fruit and vegetables were obtained from the natives in exchange for red calico, old iron-hoop, and axes; other articles of trade were comparatively useless.

Aleford Islets, four in number, small, and surrounded by reefs, are situated at the head of Milne bay, at a distance of one to 2 miles from the shore. The depths outside them increase from 10 fathoms at half a mile off, to 20 and 30 fathoms at distances of $1\frac{1}{2}$ and $2\frac{1}{2}$ miles. Many large canoes were seen in this neighbourhood, and the manner of the natives towards Europeans was anything but timorous.

Immediately to the north of Aleford islets, the coast of Milne bay appears to be low, with foul ground extending some distance from the shore; it then sweeps in a series of small, steep bights along the foot of the Stirling range, for about 20 miles, in an easterly direction, until abreast Killerton islands, where there is a larger bay, in which anchorage may be found.

After rain, large mountain torrents discharge themselves into the sea and discolour the water for some distance from the shore, and produce the appearance of shoal water.

Killerton Islands are three in number, lying in an East and West direction, nearly equi-distant from each other, and varying in distance from the shore, from one quarter of a mile to a mile. They are low and well wooded, and anchorage may be found between the eastern island and the shore of the bay, in from 12 to 13 fathoms, sandy bottom. The space between the islands, as well as that between the two western islands and the shore, is blocked with coral reef; and three dry patches extend the distance of three-quarters of a mile southward of the middle island. The passage to the anchorage is from the eastward between the eastern island and the shore, and appears clear of dangers, (H.M. schooner *Conflict*

* See plan on Admiralty chart, No. 2,123; scale, $\frac{1}{4}$ inches.

worked out); caution is, however, necessary, as coral patches abound near all the islands. The anchoring ground is about one third of a mile southward of the village. The natives here brought a dog on board, and sacrificed it on the quarter deck, apparently as a peace offering.

The anchorage is unsafe, except in fine weather during the south-east monsoon.*

Mount Killerton in the Stirling range, rising immediately above Killerton islands to an altitude of about 1,357 feet, is a conspicuous mountain, having a widespread summit, with rounded shoulders. From the south-east and north-west the summit shows in three round knobs or elevations, of which the central one is the highest. In approaching Goschen strait from the westward this mountain affords a good mark, the top being seldom clouded.

From Killerton islands the long narrow promontory, forming the northern horn of the eastern portion of New Guinea, trends N.E. by E. for about 10 miles to East cape, forming four successive bays, which have not been sounded. The hills comprising the ridge of this promontory are of regular shape and well defined, gradually decreasing in height as East cape is approached. The next two peaks, east of mount Killerton, are tufted, a small group of large trees growing near the summit of each. Eastward of these, the hollows between the hills become deeper, giving to them, when seen at a distance, the appearance of islands.

EAST CAPE is the extremity of the promontory just described, the hills of which end in a double summit 388 feet high, thickly wooded on the north-west, but clear and well cultivated on the north-east side. A narrow strip of sand-beach here fringes the coast, and a village possessing a few canoes is situated close to the water's edge. From the eastern summit of East cape the summit of Lydia island bears E. by S., distant $9\frac{1}{2}$ miles, and cape Prevost of Normanby island (D'Entrecasteaux group), N.N.E. $\frac{3}{4}$ E., distant 9 miles.

The whole of this part of New Guinea is thickly populated, the villages being mostly on the northern shores, well watered, and of unusual beauty and fertility. Large quantities of supplies may be obtained in exchange for hoop-iron.

The natives, though friendly on the first visit, at a second visit appeared shy, and could with difficulty be persuaded to accompany the surveying party, although every endeavour was made to propitiate them with hoop-iron and red handkerchiefs, and it was with evident relief that they saw the boats take their departure.

* Lieutenant J. G. Musters, H.M. schooner *Conflict*, 1878.

Anchor and Chain Islets, situated north-east of East cape, on a tongue of coral reef, north-east and south-west of each other, $1\frac{1}{4}$ miles apart, are small, low, and thickly wooded. Anchor islet is the larger of the two, and nearest to East cape, from which it is separated by a narrow boat channel, through which the tide sets with considerable strength; with the wind from S.E. a dangerous breaking sea extends nearly across the passage, but by keeping close to the mainland comparatively smooth water is found. Anchor islet is half a mile long, by about 200 yards broad, and near its centre a grassy mound rises to a level with the tops of the trees, with which it is thickly clothed. The coral reef from which the islet springs extends from its northern side to a distance of half a mile, and has several boulder rocks above water.

Chain islet is nearly one third of a mile in length, East and West, by 200 yards in breadth, densely wooded, and surrounded by a narrow strip of sand-beach. Midway between these two islets a dip takes place in the coral reef, and a sand-bank near the centre of the channel between them shows dry at all times of tide.

To the southward of Anchor and Chain islets, and between them and Lydia island, the depths are irregular, and numerous coral reefs, upon which the sea often breaks, block up what would otherwise be the shortest route through Goschen strait.

Anchorage.—The *Basilisk* anchored in 16 fathoms, sand and coral, half a mile South of Anchor islet. On moving ahead after weighing, with 10 fathoms of chain out, the anchor caught in a projecting coral rock and was lost.

CHAPTER X.

LOUISIADE ARCHIPELAGO. D'ENTRECASTEAUX ISLANDS.
NORTH-EAST COAST OF NEW GUINEA FROM EAST CAPE
TO CAPE KING WILLIAM.*

VARIATION IN 1879 :

Rossel island	- 7° 40' E.	Hercules bay	- 5° 50' E.
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LOUISIADE ARCHIPELAGO includes that extensive group of islands and reefs comprised between the parallels of 10° 10' and 11° 50' S., and the meridians of 150° 55' and 154° 30' E., with the exception of Moresby island and several small islands lying close eastward of it, and which are described in Chapter IX. About eighty islands are already known, and probably many others yet remain to be discovered in the N.W., a large space there being still a blank on the chart.†

TESTE ISLAND (of D'Urville) is a conspicuous island near the western limit of the Louisiade archipelago, its western extremity bearing S.S.E. $\frac{1}{2}$ E., distant 18 $\frac{1}{2}$ miles, from the large tree near the summit of O'Neill island (south coast of Moresby island).

The island is about 2 $\frac{1}{2}$ miles long, in an East and West direction, by a quarter of a mile in breadth; a narrow range of hills traverses its entire length, terminating in well-defined peaks at each extremity. The western peak is about 500 feet, the eastern 470 feet above the level of the sea. In the centre the hills dip considerably, and on the ridge near the western summit are two remarkable trees, which appear prominent when seen from the north or south.

An extensive reef, upon which the sea constantly breaks, borders the southern and western shores of the island to a distance of three-quarters of a mile.

The village is situated on the southern side, and appeared to be well populated.

The natives of Teste island are more uncouth than those of the islands to the north-west, and being possessed of many canoes, subsist a great deal upon fish. It is more than probable that they are cannibals, as they made

* This chapter has been much improved by the remarks and surveys of Captain Moresby, Lieutenant Dawson, and Navigating Lieutenant Mourilyan, H.M.S. *Basilisk*, 1873-4.

† See Admiralty charts: Coral sea and Great Barrier reefs of Australia, Sheet 2, No. 2,764; scale $m = 0.04$ of an inch; and New Guinea, Sheet 7, Orangerie bay to Bramble haven; and Sheet 8, Bramble haven to Rossel island, Nos. 2,123 and 2,124; scale, $m = 0.25$ of an inch.

signs to that effect regarding the skulls outside their huts, and the human jawbones worn as armlets.

Lagoon.—At the west extreme of East islet there is a lagoon about 2 miles long and one broad, with two entrances, one a quarter of a mile wide, and from 4 to 9 fathoms deep, with a rock in the centre, which may be passed on either side, the other entrance is too narrow to be available for any but small vessels. In the lagoon there are numerous shoals, but good anchorage with shelter from every wind may be obtained near the entrance.

There are three small rocks or islets in close proximity to the western side of Teste island, and one on its south-east side.

Cliffy Islet, about 250 feet high, is the largest, and formed of steep gray cliff, having a flat top covered with small scrub; it bears N.W. $\frac{3}{4}$ W. from the west point of Teste island, distant three-quarters of a mile, and is apparently steep-to all round.

West Islet is about 90 feet high, with a smooth oval summit covered with grass. It rises from the bordering reef of Teste island, and bears W.S.W., half a mile, from the west point of that island.

Boat Rock is small, black, and in the distance resembles a large boat. It bears from the west point of Teste island North a little easterly, distant half a mile, and marks the northern limit of the Teste island reef.

East Islet, about 100 feet high, has a level summit covered with grass. It bears S. $\frac{1}{2}$ W. 6 cables from the east point of Teste island, and is near the south-east extremity of the reef bordering that island. Being of the same colour as the southern slopes of Teste island, it is difficult when seen from the southward to detect that it is an islet, but if seen on an East or West bearing, it stands out clear from the shore.

Anchorage was found in 16 fathoms, sand, off the shingle beach, on the north side of the island, about a cable from the shore, with Boat rock bearing W. $\frac{1}{2}$ S.: with northerly winds this anchorage would be exposed and unsafe.

Supplies.—A few fish, yams, and cocoanuts are procurable, in exchange for iron-hoop, red handkerchiefs, and fish-hooks.

Tides.—Near Teste island the flood sets to the northward, the ebb to the southward; at springs the streams attain a rate of 2 miles an hour.

BELL ROCK, N.W. by W. $\frac{1}{2}$ W., 2 miles from the west point of Teste island, is a steep mass of gray rock, 420 feet in height, the summit and north-west side having a scattered growth of trees. It appeared steep-to on all sides, and at 3 cables north-east of it, soundings were struck in 28 fathoms, sand and shell. This rock affords an excellent mark from all directions, its shape and isolated position making it appear larger and loftier than it really is.

NEW GUINEA BARRIER REEF.—The *Basilisk* crossed the continuation of the sunken Barrier between Dumoulin island and Suckling reef. The trend of the reef was distinctly visible by a strong ripple, marking its position as far as the eye could reach, with smooth water on each side.

Soundings of 10, 15, and 18 fathoms were found on the reef; and 25 to 32 fathoms thence to Teste island. The line of sunken Barrier probably extends to Suckling reef.

LEBRUN ISLETS are two in number, lying East and West of each other, nearly 2 cables apart. The summit of the western and larger one bears N.W. $\frac{3}{4}$ N. $4\frac{1}{2}$ miles from Bell rock.

Both islets appear conical from all directions, their heights being about 350 and 150 feet. Soundings of 8 and 9 fathoms were found within half a mile of them, and a small black-headed rock, which constantly breaks, was seen near the centre of the channel which separates them. A deserted hut was noticed on the east side of the western islet, and it is probable that the inhabitants of Teste island resort there in fine weather to fish.

FOOLSCAP ROCK, taking its name from its appearance, bears N. by E. $\frac{3}{4}$ E. $7\frac{1}{4}$ miles from the east point of Teste island; it is about 150 feet high, and accessible only on the south side. The base is of bare perforated rock, but the conical summit has some thick bush, and a solitary umbrella-shaped tree.

The rock is nearly steep-to on its southern side; but a bank having upon it 6 to 10 fathoms extends $2\frac{1}{4}$ miles to the north-west of the rock, and is generally marked by tide rips. Temporary anchorage may be found upon the bank. From a distance, Foolscap rock has very much the appearance of a ship under sail.

Imbert Islet is small and woody, and lies E. by S. $13\frac{3}{4}$ miles from the east end of Teste island. A small, steep, rocky head extends off its northern end, appearing from a distance detached; and an extensive coral reef borders the southern shores to the distance of nearly half a mile.

Soundings.—A bank with depths varying from 7 to 18 fathoms connects Lebrun island with those of Blanchard and Dumoulin, the nature of the bottom being coral and sand, owing to which, and the numerous tide rips, the water has the appearance of being shoaler than it really is, there being no less depth than 7 fathoms found by the *Basilisk*, or by her boats. About $3\frac{1}{4}$ miles southward of Teste island, the sunken Barrier reef, generally marked by ripples, runs in an easterly direction, there being only a depth of from 4 to 7 fathoms, $3\frac{1}{4}$ miles S. by E. $\frac{3}{4}$ E. from the east end of the island; but it may be safely crossed with the largest Lebrun

islet on a N.N.W. $\frac{1}{4}$ W. bearing. To the eastward of Teste island the depths are from 23 to 35 fathoms, sandy bottom; but 7 miles immediately to the eastward of this distance no bottom is obtainable with 60 fathoms. About 5 miles north-eastward of Imbert islet a depth of 425 fathoms, brown sand, was found, and a continuation of no bottom at 60 fathoms between this position and Smith islet.

SUCKLING REEF, the south-western extreme of the archipelago, lies S.S.W. $9\frac{1}{2}$ miles from Teste island; it is $3\frac{1}{2}$ miles long East and West, and covered at high water; on its northern side are some detached patches and a rock awash, but no anchorage was found.

STUERS ISLETS (two) are of coral, low and woody, lying north-east and south-west of each other, three-quarters of a mile apart. The south-western one, which is nearly twice the size of the other, bears S.E. $\frac{1}{4}$ S. from the west end of Teste island, distant $9\frac{1}{4}$ miles; it is fringed with coral, and half a mile westward of it is a coral reef which dries at low water.

OUESSANT ISLAND is low, wooded, and of coral formation; it lies E.S.E. $7\frac{1}{2}$ miles from Stuers islets, and on the north-east end of a reef nearly 2 miles long. Three reefs nearly occupy the space between Ouessant and Stuers islands. Anchorage may be found under the lee of these reefs and the islets, sheltered from south-east winds; but it is not good, the bottom being foul coral, with irregular soundings, ranging from 7 to 22 fathoms.

There is a depth of 7 to 9 fathoms northward of Ouessant island, but no shelter, as the sea rolls through the openings between the reefs on either side.

SABLE ISLANDS are three sand-banks on the northern edge of a reef 4 miles long, N.E. by E. and S.W. by W., and 2 miles broad; the south-westernmost, which lies E. by S. $\frac{1}{4}$ S. 6 miles from Ouessant island, although the smallest islet, has a few trees upon it. The sand-bank near the north-east extreme of the reef is covered with vegetation; but that between them is bare. There is smooth anchorage in the south-east monsoon, at half a mile north-westward of the vegetated sand-bank.

Between a reef close to the eastward of Ouessant island, and Sable reef, is an opening nearly $3\frac{1}{2}$ miles wide; but from the mast-head green water was seen, appearing like a shoal in the opening; heavy rollers were also observed.

ANCHORAGE REEFS are two together, extending from $1\frac{1}{2}$ to $7\frac{1}{2}$ miles eastward of the north-easternmost Sable islet, from which the western side of these reefs is separated by a clear channel, nearly one mile wide.

Kosmann Islet, N.E. $\frac{1}{2}$ E., $10\frac{1}{2}$ miles from the north-east Sable islet, is small, low, wooded, and encircled by a number of small coral reefs, one of which, lying close to the eastward of the islet, is narrow, with bushes growing upon it, and extending $1\frac{1}{2}$ miles in a south-east direction; the others are detached, with mud-flats between them.

The best anchorage is in 6 fathoms, coral, at about one mile north-westward of the islet. An abundant supply of firewood may be procured here, with little chance of interruption from the natives; traces of them were seen, but the islet is not permanently inhabited.

Several dangerous coral shoals, not marked on the Admiralty chart, lie south-west of Kosmann islet.*

LONG REEF is an atoll† reef, 20 miles long East and West, and from 2 to 7 miles broad, the narrowest part being about the centre, and the broadest at its western end. The lagoon is enclosed on its north and south sides, and at its east end, by nearly a continuous barrier reef; on the north side, the reef is always above water, and has several sand-banks and much drift wood upon it; near the west extreme, at 3 to 4 miles south-eastward of Kosmann islet are several mangrove bushes.

Lejeune Islet is small, woody, and situated on the north edge of Long reef, at about 3 miles from its east extreme. Close to the westward of the islet is a narrow gap, through which the *Bramble* entered the lagoon, and anchored, in 15 fathoms, at $1\frac{1}{2}$ miles southward of the islet. This narrow pass is dangerous, it being full of coral rocks, through which the vessel was only able to thread her way by the help of a strong tide stream rushing in.

Near the centre of the southern edge of the reef are some dry rocks; but no opening was seen through any part of it, nor at the east end of the lagoon; but it is more than probable that several safe entrances may be discovered through the detached patches which stretch across the west end of the lagoon. These patches, together with Anchorage reefs and Kosmann islet, form a bay where there is good anchorage in the south-east monsoon, the water being smooth and the soundings regular. There is a narrow opening between the south-west extreme of Long reef and Anchorage reefs; but it has not been sounded, nor has the lagoon, although the latter appeared navigable.

* Lieutenant J. G. Musters, commanding H.M. schooner *Conflict*, 1878.

† "An atoll differs from an encircling barrier reef only in the absence of land within its central expanse; and a barrier reef differs from a fringing reef in being placed at a much greater distance from the land with reference to the probable inclination of its submarine foundation, and in the presence of a deep-water lagoon-like space or moat within the reef." See *The Structure and Distribution of Coral reefs*, by D. Darwin.

DUPERRÉ ISLETS are five small woody islands and a sand-bank on the northern edge of an atoll reef, 10 miles long East and West, and 8 miles broad; the central islet lies in lat. $11^{\circ} 10' 30''$ S., long. 152° E. No soundings with 100 fathoms could be obtained at more than one cable outside this reef.*

BRAMBLE HAVEN, the lagoon enclosed by the above reef, has four entrances; the only safe one is at the south-west corner of the lagoon, and is three-quarters of a mile wide, with depths of 7 to 10 fathoms.

The *Bramble* entered by a gap between the easternmost islet and the sand-bank, with the assistance of a strong tide stream running in; but the pass is full of rocks, and very dangerous. The depth of water in Bramble haven, as far as it was sounded, is from 6 to 20 fathoms, with coral and sandy bottom; the water is smooth, and sheltered from every wind by the surrounding reefs awash.

As wood is abundant on the Duperré islets, and the anchorage is so secure, Bramble haven is very convenient for ships requiring fuel or a temporary refit, more especially as it is not permanently inhabited, although sometimes visited by the natives of the larger islands to the north-eastward.

There is an opening from $2\frac{1}{4}$ to 3 miles wide between Long reef and the atoll reef forming Bramble haven, through which the tide streams run with considerable strength; no soundings could be obtained in it with 100 fathoms of line.

JOMARD ISLANDS, two in number, are low and wooded, lying close together; the south-western and larger island, E.S.E. 9 miles from the middle Duperré islet, is nearly $1\frac{1}{2}$ miles long N.E. and S.W., and half a mile broad, with a reef extending about one mile to the southward from it.

The other Jomard island lies $1\frac{1}{2}$ miles north-eastward of the former, and near the north-west end of a reef $3\frac{1}{2}$ miles long, and about one mile broad. No bottom could be reached with 100 fathoms, close to the northward and westward of the islands.

JOMARD ENTRANCE is a deep clear channel between the Jomard islands and the eastern part of the reef surrounding Bramble haven; it is from 3 to 4 miles broad, and the tide streams run through at the rate of 3 knots an hour.

MONTEMONT ISLETS, two in number, are small and bushy, lying $1\frac{1}{2}$ miles East and West from each other; the western islet lies E. by S. $8\frac{1}{2}$ miles from the south-west Jomard island; each is on the

* A group of islands about 18 in number, low and thickly wooded, in lat. $10^{\circ} 46'$ S., between the meridians of $151^{\circ} 38'$ E. and $151^{\circ} 54'$ E. (approximate); and a group of islets in about the same latitude, between the meridians of $152^{\circ} 5'$ E. and $152^{\circ} 12'$ E., were seen from H.M.S. *Cormorant*, 1879.—Lieutenant V. D. Hughes.

northern edge of a coral reef, the eastern and larger reef being 4 miles in circumference; there is a third, and still smaller reef, at $1\frac{1}{2}$ miles westward of the western islet. These reefs are steep-to on their south sides, but there is a coral patch at N.N.W. three-quarters of a mile from the eastern islet. Tolerable anchorage may be found on the northern side of the islets, but the soundings are irregular, with foul coral bottom.

DUCHÂTEAU ISLANDS are three in number, and are low and wooded, extending 2 miles in line E. by N. and W. by S. They may be seen at a distance of 10 or 12 miles from a ship's deck, as some of the trees on them are from 60 to 70 feet high, and these are overtopped by a few cocoa-nut trees.

The islands are not permanently inhabited, but the natives of the larger islands to the northward visit them occasionally in sufficient numbers to prove troublesome to any small vessel which may come here.

These islands are frequented by pigeons and bush turkeys.

The westernmost and largest island is surrounded by a covered reef 3 miles in circumference. There is a channel, 2 miles wide, between this and the Montemont islets; it is clear of all dangers, with the exception of two sunken patches, one with 3 fathoms, at S.W. $1\frac{1}{4}$ miles, and the other with 4 fathoms on it, at one mile westward of the westernmost Duchâteau isle.

The two eastern islands are on the northern and north-western edges of a reef, dry at low water, $2\frac{1}{2}$ miles long East and West, and one mile broad.

Raymond, the central Duchâteau island, affords the best shelter during the south-east monsoon; the anchorage recommended being in 17 and 19 fathoms, sand and shells, at half a mile northward of it; with the east end of the isle bearing S.E. by S., and the north end of the western isle S.W. by S. There is a narrow channel between Raymond island and the reef which surrounds the west island; but it is not a good one, owing to the heavy swell which rolls through it.

Montemont and Duchâteau islands lie from 2 to 3 miles within the 100-fathoms edge of the bank of soundings, which, together with the barrier reefs, extends eastward 114 miles from the south-west Jomard island, to their east extremity, in lat. $10^{\circ} 40'$ S., long. 154° E.

CALVADOS CHAIN is a group of high islands, extending about 45 miles from Real island—which lies N.N.W. $8\frac{1}{2}$ miles from Raymond, or the centre Duchâteau isle—eastward to Flat island, the central hill of which is in $11^{\circ} 9' 30''$ S. and $153^{\circ} 5'$ E.

All the islands of the Calvados chain are well wooded and inhabited; their southern shores (which only were examined) present a most pleasing aspect; large groves of cocoa-nut trees being seen on the low lands about the bays, with rich vegetation on the hills above.

The greater number of the natives appeared to come from the northern sides of the islands, which in both monsoons are more sheltered than the south.

The Calvados islands appear to be very productive and comparatively well cultivated, as a great quantity of yams and cocoa-nuts were brought off to the *Bramble* whilst surveying the islands; and some of the natives who crossed over to the *Rattlesnake*, when at anchor near the Duchâteau isles, brought other articles besides yams and cocoa-nuts, for barter, amongst which were some productions of the country not previously seen—indian corn, ginger, and sugar-cane.

Some of the canoes are large; but not superior to those seen on the coast of New Guinea and Torres strait before alluded to.*

REAL ISLAND, already mentioned, is 2 miles long, and nearly one mile broad at its eastern end; the other portion of the island is very narrow, terminating to the westward in a rocky point. It is remarkable for its rugged and abrupt shape, being composed of cliffs nearly perpendicular, with deep ravines between them. Its most elevated summit, which is 554 feet high, is near its east end. A few natives were seen, who use small catamarans which they haul up on the ledges of rock, in a small bay on the north side of the island.

Rugged Islet, which is small and rocky, lies one mile off the west end of Real island. At $2\frac{1}{2}$ miles northward of this is Tuft islet, on the northern edge of a reef extending 7 miles westward from Real island; and which encloses Rugged islet. Numerous detached coral patches lie off the southern side of this reef, on which the sea breaks heavily. The north-west side is broken and irregular, and is a continuation of the 100-fathoms edge of the bank of soundings, extending northward from the south-west Jomard island.

Burnett Islet, which is small and woody, lies 3 miles northward of Real island, and is surrounded by a reef $2\frac{1}{2}$ miles in circumference, between which and Real island is a deep channel $1\frac{1}{2}$ miles wide. The tide streams run through this channel with great strength, and there are several dangerous sunken patches close to the edge of the reef, between Real island and Tuft islet.

* The most remarkable feature in these canoes is the sail; it is about 15 feet in width by 8 in depth, and is made of rather fine matting, stretched between two yards, rounded and secured at the ends, forming a sort of long oval. When hoisted it spreads obliquely upwards across the mast, the lower and foremost end resting on the stage, and the tack secured to the mast. Both ends being alike, the mast central, and the sail large and manageable, a canoe of this rig is well adapted for working to windward. Tacking is simply performed by letting go the tack, hauling upon the sheet, and converting one into the other. The large steering paddles are 8 or 9 feet long, with an oblong rounded blade of half the length. These canoes are frequently propelled by paddles of this kind used as oars, secured to the gunwale by cane grummetts.

EDDYSTONE ISLAND, E. by N. $\frac{1}{2}$ N. $8\frac{1}{4}$ miles from Real island, is small, rocky, and remarkable, rising near its east end to a peak 518 feet high ; it is most conspicuous when seen from the eastward, as it then has the appearance of a lofty conical tower. The island is surrounded by a reef nearly 4 miles in circumference. At half a mile north-westward of the west point of the island is a dangerous coral patch, over which the tide stream sweeps with great velocity.

SLOSS and BROOKER ISLANDS.—A chain of five coral reefs extends from 5 miles N. by W. of Real island to 4 miles N. $\frac{1}{2}$ E. of the Eddystone, with narrow openings between them from the southward. Close to the northward of the first opening from the westward are the two Sloss islets, which are low, small, and wooded. On the third reef is Brooker island, $1\frac{1}{4}$ miles long, with a hill on its southern point, 336 feet high. On the fourth, which is the smallest reef, are two small islets with bushes on them. And on the easternmost reef are four islets of moderate elevation and sterile appearance, two of which are on the east edge of the reef.

The southern edges of these reefs are steep-to, the depth being from 15 to 20 fathoms within half a mile of them.

There are no anchorages that can be recommended, between the islands, but it is very probable that good ones may be found on their northern sides ; and that many of the openings between the various islands are safe channels. Vessels may anchor to the southward of these islands, even in the south-east monsoon, anywhere within 2 or 3 miles of the shore, free from reefs ; but as the south sides of the islands form a lee shore, and the depth of water is from 20 to 40 fathoms, such anchorages are not desirable.*

The MEWSTONE is a conspicuous island, 3 miles long E.S.E. and W.N.W., and 2 miles broad ; its western end rises to a pyramidal hill, 995 feet high, bearing N.E. $\frac{3}{4}$ E. $3\frac{3}{4}$ miles from the peak of the Eddystone. This hill is most conspicuous when seen from the south-east, as it then presents a remarkable peak, but when seen from the south-west, it appears table topped ; from the peak, a ridge of hills gradually descends to the south-east point of the island. The southern shore forms a bay, skirted by a narrow coral reef, on which the sea breaks heavily. Two villages were seen near the bay.

Two small high islands lie off the north-west point of Mewstone island, one at S.W. half a mile, and the other at one mile westward of the point ; beyond the latter, are two rocks above water. The two islets appear to be connected by a reef, which extends about $1\frac{1}{2}$ miles from them, towards the Eddystone. There is deep water close to the north-west edge of the reef, affording sheltered anchorage, in 20 to 27 fathoms ; but the tide streams are strong.

* A barrier reef (with numerous islets) extends N.E. 13 miles from the north end of Brooker island, thence E.S.E. 24 miles, as far as could be traced.—Lieutenant V. D. Hughes, 1879.

STANTON ISLAND, E. by S. $\frac{1}{2}$ S. 5 miles from the Mewstone, is $2\frac{1}{2}$ miles long East and West; but its breadth was not ascertained; it rises towards its west end, to an elevation of 603 feet, and appears to be covered with a coarse kind of grass, and some small trees and scrub. A reef, with a small islet on it, stretches out one mile from the southern coast, and extends $1\frac{1}{2}$ miles eastward from the western point of the island; but between the reef and the east point of the island is a depth of 18 fathoms, close to the shore; the edge of the reef is steep-to.

A shoal of coral ground, with 13 or 14 fathoms water upon it, lies $2\frac{3}{4}$ miles South of the south-west extreme of Stanton island. From the shoal, Huxley island summit bears N. 34° E., distant 5 miles; and summit of Mewstone N. 53° W., distant $9\frac{1}{2}$ miles.

A sunken danger, with 3 fathoms upon it, lies $2\frac{3}{4}$ miles S.S.E. from the east extreme of Stanton island. From the shoal, Huxley island summit bears N. 3° E., distant $3\frac{1}{2}$ miles; and summit of Mewstone N. 62° W., distant 11 miles.* See page 551.

Green Island lies close to the westward of Stanton island, with which it is connected by a reef; on its western edge is a small coral islet, with a few bushes on it.

Between the Mewstone and Green island are two islets and a small high rock; the islet nearest the Mewstone is high, with foul ground extending south-westward from it; the other is low and woody with a high knob at its west end. Between these islets the tide runs strong.

HUXLEY ISLAND, at about one mile eastward of Stanton island, is small and spreads out into points; it rises in the centre to a peak, 755 feet high. Between this and Stanton island is a low rocky islet.

At E.S.E. 3 miles from Huxley island, is a small high island nearly $1\frac{1}{2}$ miles long; one of the hills near its eastern end being 428 feet high. Two small islets, surrounded by a reef, lie N.W. by N. $1\frac{1}{2}$ miles, and a third islet 2 miles, from the island; and off its north-east point are four rocky islets; the outer of which, Sail rock, distant $1\frac{1}{2}$ miles from the point, resembles a vessel under sail.

SHARPE ISLAND, S.E. by S. $1\frac{1}{2}$ miles from Sail rock, is one mile long, and rises to a peak 380 feet high. There is a small islet between it and Sail rock. Temporary anchorage may be obtained between Sharpe island and Sail rock, in 14 to 15 fathoms, sand.

EARLE ISLAND is small, high, and lies $2\frac{1}{2}$ miles eastward of Sharpe island; it has three points spreading out from its south-eastern end, enclosed by a narrow reef, with a rocky spit running half way out to Quoin rock, which lies E.N.E. one mile from the east point of the island.

* Lieutenant J. G. Musters, commanding H.M. schooner *Conflict*, 1878.

ROBINSON ISLANDS are both hilly, and separated by a very narrow opening; they are together, 3 miles long from East to West; the highest part of the western island is 644 feet in height, and 3 miles eastward of Earle isle. A high islet lies close off the north-west point, and a low one close to the southward of the east point of Robinson island. A shoal extends nearly one mile south-westward from the latter islet; but with this exception, the southern shores of these islands appear steep-to.

Coral shoal.—H.M. schooner *Conflict*, in 1878, passed over a coral shoal, on which the bottom was clearly seen, at $1\frac{1}{4}$ miles S. $\frac{3}{4}$ W. from Robinson island, south extreme. From the shoal Quoin rock bears N. 35° W., distant $3\frac{1}{2}$ miles, and Kalouma island, west extreme, N. 50° E. distant 4 miles.

KALOUMA ISLAND* was only defined on its southern and eastern sides; but it appeared to be of triangular shape, each side being about 5 miles long. Two ridges of hills rise gradually from the north-eastward; one branching into small ridges near the west point, and the other sloping abruptly down to the south point of the island; the highest part of each ridge is near its southern end; the western summit being 962 feet, and the eastern, 768 feet in height. The valley between these hills opens on the south side of the island into a bay with shoals stretching nearly across it.

The southern coast of Kalouma island is steep and bold to approach, the water being deep within a mile of it. A small islet lies close to the northward of the west point, and a reef stretches out half a mile from the east side of the island, extending one mile northward from the east point. A three fathoms patch lies one mile South from the west of the bay. This island is populous, and a large village was seen on its northern point.

FLAT ISLAND, the easternmost of the Calvados chain, is 3 miles long East and West, but its breadth was not ascertained. A low ridge of hills rises from its southern shore, which is skirted by a narrow fringe of coral; its north side was not examined. Some native houses were seen on the island.

An opening about one mile broad, separates Kalouma, from Flat isle; but it appeared to be blocked up by a number of coral patches, extending across its south entrance.

The southern shores of all the Calvados islands are bold to approach within a mile, in deep water, except those described as having reefs extending a short distance from their southern sides.

* Native word for iron.

ST. AIGNAN ISLAND, the northernmost part of the Louisiade archipelago seen during the survey, is a large island, about 25 miles northward of the Calvados group. It was too distant to allow of its limits being determined. A lofty range was seen on it, extending 15 miles from W. by N. to E. by S., the highest summit of which is in lat. $10^{\circ} 42' S.$, long. $152^{\circ} 43' E.$, and is about 3,300 feet high.

Little is known of the sea between the Calvados group and this island; but several low islands were seen, the positions of which were not accurately determined; nor was the 100-fathoms edge of the bank of soundings traced farther to the northward and eastward than to the reef 5 miles northward of Real island.

About 8 miles south-eastward of cape Henry, St. Aignan island, the Renard islands are marked on the charts, as extending about 11 miles to the south-east, and being about 12 miles northward of Robinson island. Basses islands, between the Renard group and the Mewstone, of the Calvados chain, are also laid down. The Deboyne islands are another group lying a few miles westward of St. Aignan island, but the position is doubtful. These several groups of islands were seen by D'Entrecasteaux in 1793, but have not since been examined.*

JOANNET ISLAND is 11 miles long W. by N. and E. by S., and from $1\frac{1}{4}$ to 3 miles broad. It is separated from Flat island by an opening one mile wide, in which is Entrance islet; and at $3\frac{1}{2}$ miles north-eastward of it, is Low wooded islet.

A high ridge of hills extends along the whole length of the island, with the exception of about 2 miles of low wooded land near its north-west extreme. These hills rise most abruptly from the southern shores, and slope down gradually north-eastward. Mount Asp, the highest summit of the range, and 4 miles westward of the east point of the island, is 1,104 feet in height. The island is well wooded, and has a fertile appearance, with numerous groves of cocoa-nut trees near the sea.

The northern side of Joannet island was not closely examined, but it appeared as far as could be seen nearly straight. The eastern end is bold, and backed by a steep coast range. It may be approached within half a mile, except near June point, the easternmost extremity of the island, where a reef runs out nearly one mile from the point. The southern side is very irregular, consisting of four projecting hilly points, with three bays between them.

N.W. bay is about $1\frac{1}{4}$ miles broad; two reefs stretch out from its north-west point, which has a rock close to the southward of it, one reef N.W., and the other south-westward of the point, the latter reef being separated from the rock by a narrow channel. A small hilly island lies in the

* About 15 miles east of Renard islands, in lat. $10^{\circ} 57' S.$, long. $153^{\circ} 23' E.$; a reef extending about 6 miles in a S.E. by E. direction, was observed from the *Cormorant*.—Lieutenant V. D. Hughes, 1879.

centre of the bay, between which and the channel is a coral patch; a sandy spit extends north from the island for some distance, this spit together with numerous reefs completely block the passage between the island and the north shore of the bay. The spit is about 20 yards wide and dries at low-water. The shores of the bay are mostly skirted by reefs, but within the south-east point, and under Bounce point in 10 fathoms, sand, good anchorage may be found in the south-east monsoon. There are two or three villages in this bay.

The next or Middle bay, is $1\frac{1}{2}$ miles wide, and although it runs nearly the same distance inland, it is so full of shoals as to be useless as a harbour; this is separated from N.W. bay by a hilly peninsula, terminating to the southward at Bounce point, close to which are two small islets, one on its east side, and the other at one quarter of a mile off the point; the latter is a remarkable green peaked islet, with a small patch close to the eastward of it. On the point were seen two large villages.

The south-east bay is $2\frac{1}{2}$ miles broad, and one mile in depth; the south-east side is a peninsula, rising to a hill 876 feet high, forming the southern extremity of the island; a point of this peninsula runs out to the westward with a reef, having a small island near the end, extending half a mile westward of it. The north-west side of the bay is skirted by reefs.

Joannet Harbour extends about 2 miles into the east side of this bay, northward of the reef and point just described, and is one mile wide at its entrance. It is well sheltered, and easy of access, but was not sounded.* There is a large village on the hill at the head of the harbour.

The natives were warlike and treacherous, some of them having attempted to cut off two of the boats of H.M.S. *Rattlesnake*.†

Grass Island, close to the southward of Bounce point, is so named from being covered with long grass. It is $1\frac{1}{2}$ miles long N.W. and S.E., and rises to a ridge in the centre; its highest part being 409 feet in height. The north-east side is fringed by a narrow coral reef; and a coral spit runs out from the southern point of the island; on the end of this spit is Button rock, above water and of remarkable appearance. There is a dangerous 3-fathoms shoal at one mile South of the rock, and a number of small reefs lie scattered from one to 5 miles westward of Grass island, with deep water all round them.

* There is good anchorage in this harbour in 10 fathoms, mud, which depth is struck immediately after passing the eastern point.—Lieutenant J. G. Musters, commanding H.M. schooner *Conflict*, 1878.

† Lieutenants Dayman and Simpson, in H.M.S. *Rattlesnake's* galley and pinnace, when at anchor near Bounce point, were attacked by the natives in three canoes, at about day-break; after a pretended offer to barter with the pinnace, they suddenly turned to the galley, then in shallow water, which they tried to upset, and also to drag on shore; whilst weighing the anchor, the bowman was struck by a stone axe, and another was wounded by a spear; and it was not until the natives experienced the effects of some buck shot, as well as the discharge of a musket, that they gave up their daring design.

BRIERLY ISLAND, S.S.E. 3 miles from Button rock, is wooded, and $1\frac{1}{2}$ miles in circumference, rising to a peak in the centre, which attains an elevation of 347 feet; the islet is fringed with coral, and a narrow reef projects three-quarters of a mile from its north-west point, with a patch of sand on its extreme end; the reef is steep-to on all sides, and there is anchorage, in 14 to 16 fathoms, at half a mile off the isle.

Brierly island is cultivated in many parts, and at the time of the survey in 1850, supported from 30 to 40 inhabitants, who occupied two villages on the north side; the huts were built upon posts, raised 2 or 3 feet from the ground, and thatched with the leaves of the cocoa-nut tree.

A fair supply of yams was procured at the island, in exchange for a few small hatchets and some pieces of iron-hoop. The natives readily came off to the *Rattlesnake*; but were adverse to strangers landing upon their island.

HENDERSON REEF is covered coral, extending from $1\frac{1}{4}$ to 7 miles westward of Brierly isle, with a sand-bank on its western end: the northern edge of the reef is steep-to; but its southern side was not traced. A small patch of coral, with some dry sand, lies $2\frac{1}{4}$ miles westward of the sand-bank.

SUD-EST ISLAND, the largest of the Louisiade archipelago, is 40 miles long, from Lory point, its north-west extreme, E. by S. $\frac{1}{4}$ S. to cape Sud-est, its south-east point; and about 8 miles in average breadth. A range of lofty hills runs through the middle of the island, gradually rising from the extremities towards the centre, near which it is intersected by two valleys, extending across the island, thus separating from the other parts of the range, mount Rattlesnake, the central and highest mountain, which is in lat. $11^{\circ} 31' 30''$ S., long. $153^{\circ} 27' 15''$ E., and is 2,689 feet high.

Sud-est island was not sufficiently explored to admit of much being said as to its character, or productions. Many extensive tracts of apparently rich land were seen in the valleys, and at the base of the hills; it is well wooded, and there can be little doubt of its being as well watered, by streams descending from the mountain range in the interior.

Numerous groves of cocoa-nut trees were seen near the sea, especially on Condé point, the south extreme of the island, which was nearly covered with these trees; but this did not appear so populous, in proportion to its size, as many of the smaller islands.

The north-west end of Sud-est island, from Lory point south-westward, $2\frac{1}{4}$ miles to Brady point, is low and woody, with a coral flat extending from one to 2 miles from the shore. Several detached patches lie off the edge of this flat, with deep water close to them.

Passage Reef extends from $1\frac{1}{2}$ to 3 miles north-westward of Lory point; and is nearly connected by coral reefs with the reef running out from the point.

There is a clear channel 2 miles wide between Lory point and Huxley point—the south extreme of Joannet island—but it is contracted to one mile in breadth, to the north-westward by Passage reef: the water is deep in the channel, and appears clear of dangers.

From Lory point the north-eastern shore of Sud-est island trends E. by S. $\frac{1}{2}$ S., 6 miles to Nepenthes point; it is low and wooded, but steep-to, and may be approached to half a mile, in from 4 to 11 fathoms.

Water.—Immediately to the eastward of Nepenthes point, is a small bay with a creek, running in from its bight, navigable for boats; a stream of fresh water flows into this creek, from which the *Rattlesnake* received 78 tons in a week; but the boats were obliged to go nearly a mile up the creek, before the water was found fit for use.

H.M. schooner *Conflict* anchored in 1878 in this bay in 12 to 13 fathoms, mud.

From the watering creek to a low point, at E. $\frac{3}{4}$ S. 14 miles from it, the shore is regular, and for the first 9 miles, backed by a low woody range of hills: the coast afterwards trends E.S.E. 19 miles to cape Sud-est; this latter part was only seen from a distance; but it appeared to be low and well wooded.

CONDÉ POINT, W.S.W. 15 miles from cape Sud-est, is the extremity of a hilly peninsula, forming the south point of Sud-est island. The intermediate coast was not closely examined.*

Bousquet Point, W.N.W. 20 miles from Condé point, is the south-west extreme of a narrow peninsula, with three hills upon it, stretching out $2\frac{1}{2}$ miles from a low projection of the island: two detached reefs lie 2 miles westward of the point.

A high range of hills descends from mount Rattlesnake, terminating at a bold promontory between two bays, which extend a considerable distance into the valleys, already described as crossing the island.

On the north-west side of Bousquet point, the low wooded shore recedes, so as to form a bay, about 4 miles wide, and 3 miles in depth; but it appeared from the mast-head, to be occupied by coral-flats throughout. The remaining coast of the island, from this bay to Brady point, is low and wooded, and inaccessible on account of the reefs which stretch out from it.

* The natives frequently visited the *Bramble*, bringing off cocoa-nuts, plantains, &c., which they exchanged for hoop-iron; they wore as armlets, human lower jaw bones with the clavicle secured across the ends; these they did not hesitate to part with.—Mr. George H. Inskip, H.M.S. *Bramble*, 1849

A shoal, on which the bottom was clearly seen, is situated about 3 miles from the south-west point of Sud-est island, with Bousquet point bearing N. 37° W. distant 7 miles; and mount Rattlesnake bearing N. 45° E.* Probably there are other coral patches in the same direction, *see* page 551.

PIRON ISLAND, the centre of which lies N. $\frac{1}{2}$ W. 11 miles from mount Rattlesnake, is 5 miles long W. by N. and E. by S., and one mile broad, with rocks close off its eastern point. A ridge of grassy hills, of moderate height, extends through the length of the island, sloping gently towards each extreme. There are a few solitary bushy trees on the hills, and patches of brush along the shores and in the hollows. Few inhabitants were seen on the island.

Round Islet, $4\frac{1}{2}$ miles south-westward of the west point of Piron island, is small, wooded, and 230 feet high; it is situated on the south-west point of an extensive reef surrounding Piron island. The southern edge of the reef was only distinguished by the heavy breakers upon it; but there appeared to be a passage between it and the northern shore of Sud-est island.

From the rocks off the eastern extreme of Piron island, the outer edge of the reef, which here assumes the character of a perfect barrier, extends W.N.W. about 17 miles, when it terminates at a 4-fathoms spit, 4 miles northward of June point the east extreme of Joannet island. The western edge of the reef enclosing Piron island forms a bay, reaching within $1\frac{1}{2}$ miles of the western end of the island: this edge of the reef is steep-to, and may be approached to half a mile; but several detached patches lie about $1\frac{1}{2}$ miles north-westward of Round islet.

BRAMBLE PASS is a narrow entrance through the Barrier reef into Coral haven, N. by W. $\frac{1}{2}$ W. 6 miles from Round islet and N.E. $\frac{1}{2}$ E. 5 miles from the highest part of Pig island, a green hilly island in Coral haven.

As this opening is only 2 cables wide, and the tide stream runs through with great velocity, no ship should attempt it without a good commanding breeze, or with the sun ahead, as several dangerous rocks lie in the channel.

A broader passage may be found between the north-west extreme of the Barrier reef and June point; but as numerous coral patches are scattered in the opening, through which a vessel would have to beat in the south-east monsoon, Bramble pass may be considered preferable at that season of the year.

CORAL HAVEN is an extensive harbour, bounded to the northward and eastward by the Barrier and Piron reefs; and to the southward

* Lieutenant J. G. Musters, commanding H.M. schooner *Conflict*, 1878.

and westward by Sud-est and Joannet islands. It is accessible from the northward by Bramble pass; from the north-westward by the opening between the north-west extreme of the Barrier reef and June point; and from the westward by the channel between Lory and Huxley points; and there may be an entrance between the north-east side of Sud-est island and Piron reef as above noticed. The haven is thickly studded with islands and reefs, rendering its navigation intricate.

Coral haven is a very secure harbour, completely sheltered from every wind, and with smooth water; but the approaches to it are intricate and somewhat dangerous for a stranger to attempt, without great caution; and as the numerous islands about it are peopled by a fierce and warlike race, great discretion is necessary to guard against treachery.

PIG ISLAND, the largest in Coral haven, extends from $1\frac{1}{2}$ to $3\frac{1}{2}$ miles north-eastward of Lory point, and rises in the centre to a ridge of hills, the highest of which is 479 feet in height: it is well wooded, and, from the number of natives seen on it, must be fertile. There were two large villages, one on the north, and the other on the north-west part of the island. A reef runs out $1\frac{1}{2}$ miles to the eastward from the north-east side, with a small high islet—on which were some cocoa-nut trees and long grass—on the southern edge of the reef. A spit, with a flat rock on its extremity, projects half a mile from the south-west point of Pig Island, between which and Lory point is a deep clear channel three-quarters of a mile wide. There is good anchorage in the bay on the west side in 10 fathoms, but it ought not to be entered too far, as many detached coral patches exist.

OBSERVATION REEF, E.S.E. $1\frac{1}{2}$ miles from the cocoa-nut islet, just noticed, is small with a patch of sand on its west end, covered at high water. This little sand-patch, which was selected by Captain Stanley as the first observation spot for the survey of the Louisiade archipelago, lies in lat. $11^{\circ} 18' 39''$ S., long $153^{\circ} 18' 15''$ E. Some other coral patches lie about a mile south-eastward of Observation reef.

Dip Reef is a small bank of broken coral about one mile south-westward of Observation reef; it was so named from the magnetical observations having been obtained there. At S. by W. $\frac{1}{2}$ W. $1\frac{1}{2}$ miles from Dip reef is a small flat coral islet, with deep water all round it.

Five other detached coral reefs lie scattered over the northern part of Coral haven. Three of them lie nearly in line, bearing S.E. by E. $\frac{1}{4}$ E. from June point, the largest reef being 2 miles, the middle one 4 miles, and the south-easternmost $5\frac{1}{2}$ miles from the point. The other two lie nearer the Barrier reef, one, which is covered, being S. by W. one mile, and the other S.S.E. $2\frac{1}{2}$ miles from Bramble pass. There is also a dangerous 2-fathoms patch, N.E. by N. one mile from the cocoa-nut islet.

Between all the islands and reefs just enumerated, the water is deep close to their edges. There may be many other dangers yet to be discovered, which may be easily seen from aloft, the water being very clear.

DIRECTIONS.—A vessel entering Coral haven by Bramble pass, and having distinctly made out the opening, should steer boldly through the middle of it; the deepest water will be seen from the mast-head, from whence directions should be given. Pass to the westward of the covered reef which lies S. by W. one mile from Bramble pass, and after steering towards the cocoa-nut islet take up a berth as most convenient.

For entering by the north-west or west channel, the chart, and a careful look-out from aloft, will afford the best guidance.

Garden Island, on the south-west side of Sud-est island, and 4 miles north-westward of Bousquet point, is about $1\frac{1}{2}$ miles in circumference, and rises to a peak in the centre; it is situated on the south-west edge of a reef, of which no other part was traced. The island derives its name from its very rich and fertile appearance.

Anchorage may be obtained in the bay between Garden island and Bousquet point in 10 or 12 fathoms, taking care not to proceed too far into the bay as numerous coral shoals exist. There is also a good temporary anchorage to the westward of the island.*

Woody Islet, which is small, but high, lies nearly W. by S. $\frac{3}{4}$ S. 4 miles from Garden island, and on the southern bend of a reef, extending $2\frac{1}{2}$ miles north-westward, and one mile north-eastward from the islet. Another reef, of which the south-western edge only was traced, lies from $1\frac{1}{2}$ to 4 miles northward of Woody isle. The space between, is full of small coral patches; and between Garden and Woody isles, is a small reef, with deep water round it.

Chaumont Islet is a mass of dead coral, with a few stunted bushes upon it, lying South $5\frac{1}{4}$ miles from Woody islet, and on the east end of a reef, which was not closely examined.

Between Woody and Chaumont islets, reefs extend 6 miles East and West, with a deep channel, one mile wide, between their northern edge and Woody islet; and there is a broader channel between the southern side of these reefs and Chaumont islet. These islets and reefs are surrounded by innumerable coral patches, which will be best comprehended by a glance at the chart.

Southern Edge of the Bank of Soundings.—From 3 miles southward of Duchâteau islands, the 100-fathoms edge of the bank of soundings trends eastward about 16 miles to a small coral reef awash,

* Lieutenant J. G. Musters, commanding H.M. schooner *Conflict*, 1878.

which is the commencement of a barrier, forming the southern and south-east limits of the Louisiadé archipelago; this barrier then extends 80 miles in a general E. by S. direction, and rounds cape Sud-est at the distance of about 10 miles from its extreme point.

DUCHÂTEAU ENTRANCE.—The best approach to the Calvados islands and Coral haven from the southward and westward, is over the edge of the bank of soundings, between Duchâteau isles and the western extreme of the Barrier reef; the depth of water varies from 10 to 20 fathoms, except on two shoals, one with 8 fathoms on it, at E. $\frac{1}{2}$ N. 6 miles, and the other, with 5 fathoms, at E. by S. 11 miles from the easternmost Duchâteau island.

The **BARRIER REEF**, from the coral reef awash, at 16 miles eastward of Duchâteau islands, first trends S.E. by E. $\frac{1}{2}$ E. 24 miles, and then in a serpentine direction nearly E. $\frac{1}{2}$ S. 15 miles to Smith pass. The first 10 miles of the Barrier consists of detached reefs, with foul ground between; but the remaining portion has no opening through it.

SMITH PASS, S.W., 16 miles from mount Rattlesnake, is a clear channel three-quarters of a mile wide, with from 5 to 19 fathoms. There are three coral patches inside the channel, which, when entering, must be passed on their eastern side. A large detached reef lies close outside the barrier, from $3\frac{1}{2}$ to $6\frac{1}{2}$ miles westward of the entrance. From Smith pass the barrier trends eastward 16 miles to Johnston pass, without any opening between these entrances.

JOHNSTON PASS is a deep clear channel, nearly $1\frac{1}{2}$ miles wide, and lying only 4 miles S.W. by W. from Condé point, it affords the nearest and best approach to the southern side of Sud-est island, and is easily made out by the bearing of mount Rattlesnake.

SUD-EST BARRIER REEF extends eastward 21 miles from Johnston pass, and then sweeps round to the northward, enclosing cape Sud-est; but it was only traced northward and westward, to 6 miles N.E. of the cape when the reef was lost sight of.

The whole of these barrier reefs are awash, with the exception of the first 10 miles from the western extreme; their average breadth being about a mile. Good sheltered anchorage, in 12 to 20 fathoms, may be found anywhere within, but no soundings could be obtained outside the barrier, even within a cable; and as there are no other openings besides those described, a sailing vessel should not approach too near the back of the reefs, especially in light winds.

The space bounded by the edge of the bank of soundings and the Barrier reef to the southward, and by the Calvados islands to the northward, is from $7\frac{1}{2}$ to 23 miles wide, the average depth being about 30

fathoms, coral and sand. But the innumerable small reefs and mushroom-shaped coral patches which spring up in all directions, some of them even in the deepest water, demand the mast-headman's unceasing vigilance, as the lead gives no warning of approaching these dangers.

Detached Coral Patches.—Westward of the meridian of Robinson islands, described at page 542, the patches in the above space were not so frequently met with as they were to the south-eastward; and may, therefore, be briefly enumerated. The first is a 3-fathoms patch at 3 miles southward of the Eddystone.

Two coral patches lie $4\frac{1}{2}$ miles off the west point of Stanton island; one bearing S. $\frac{3}{4}$ W. with 5 fathoms, and the other S.S.E. $\frac{1}{2}$ E., with 4 fathoms upon it; deep water surrounds each of them, and between the former and the islands are strong tide ripples. A coral patch with 3 fathoms water on it lies with Huxley peak bearing N. $\frac{1}{4}$ E., and the Mewstone N.W. by W. $\frac{1}{2}$ W.; and another patch having 13 to 14 fathoms water on it, lies within, Huxley peak bearing N.E. by N., and the Mewstone N.W. $\frac{3}{4}$ W.

A chain of coral patches extends from $3\frac{1}{2}$ miles S. $\frac{3}{4}$ E. to $8\frac{1}{2}$ miles S.S.W. $\frac{1}{2}$ W. of the peak of the western Robinson island; there is deep water on the west side of them.

There is a small reef awash at E.N.E. 9 miles, and another at E. by N. 10 miles from the west end of the Barrier reefs. At S.E. by S. 3 miles from the latter reef are three smaller reefs, connected with each other by shoal water.

To the south-eastward of the dangers just enumerated, the sunken coral patches between Sud-est island and the Barrier reefs are too numerous to be detailed, and will be best comprehended by referring to the chart. Between Johnston pass and the southern side of Sud-est island the water seemed much more clear of shoals.

The space between the Sud-est barrier and the coast of the island, from Condé point to cape Sud-est was not entered; but it appeared from the mast-head to be navigable; although it is doubtless studded with sunken patches of coral, of which those described can be but a small proportion.

ROSSEL ISLAND, the easternmost of the Louisiade archipelago, is 22 miles long E. by N. and W. by S., and $10\frac{1}{2}$ miles broad at its centre, terminating in a well-defined point at each end.

Mount Rossel, the highest part of the island, is near its centre, in lat. $11^{\circ} 20' 30''$ S., long. $154^{\circ} 8'$ E., and rises to a height of nearly 3,000 feet; from it the hills gradually descend to the eastward, terminating at cape Deliverance, the easternmost extreme of the island. On the western side, two ridges branch off from mount Rossel; one in a W.S.W. direction to a high hill, 4 miles from the West point; and the other westward, termi-

nating at a bluff, N.E. $\frac{1}{2}$ N. 6 miles from West point. A deep bay runs into the valley between these ranges, from the westward, the hills sloping down to the water's edge on either side.

Rossel island is thickly wooded, with occasional large, clear grassy patches. The mountain ridges form short narrow crests, and occasional peaks, but the outline is smooth, and the rock nowhere exposed, even the steepest ridges being covered with vegetation. Some of the trees appeared of great size; others were tall and straight, branching only near the top. Large groves of cocoa-nut trees were seen, in some places, extending from the water's edge to half way up the hills, showing a pleasing break in the sombre green of the forest country. Most of the shores are either bordered by mangroves, with occasional sandy beaches, or clothed with the prevailing jungle of the island.

Tree Islet, about $1\frac{1}{2}$ miles north-westward of the west point of Rossel island, is small and rocky, with two or three conspicuous trees upon it, but its position is doubtful.

High Island lies $1\frac{1}{2}$ miles westward of the bluff at the north-west point of Rossel island.

From the bluff to the north point of Rossel island, close off which is a rock above water, very steep hills slope down to the shore. Immediately to the westward of the rock is a creek, probably the mouth of some mountain stream. Between the north point of the island and cape Deliverance are some well-wooded and apparently fertile valleys.

CAPE DELIVERANCE, which may safely be approached to the distance of one mile on its north-east side, lies in lat. $11^{\circ} 23' S.$, long. $154^{\circ} 18' 30'' E.$; but it is a low point, and not visible beyond 6 or 7 miles.

The south side of Rossel island, from cape Deliverance to S.W. point—which lies S.E. by E. $\frac{1}{2}$ E. $4\frac{1}{2}$ miles from West point—consists of numerous points and bays of no great depth, with steep ridges of hills descending to the sea from the high mountain range above.

Between S.W. and West points, the shore is steep and rugged; the hills descending abruptly to the shore.

Rossel island appeared to contain numerous inhabitants.* Many huts were seen on the northern side, close to the beach; usually three or four

* On the 30th of September 1858, the ship *St. Paul*, bound from Hong-kong to Sydney, with 327 Chinese passengers on board, was totally wrecked on this island, when all hands reached the shore. The captain and eight of the crew then left in a boat to obtain assistance, and on the French steamer *Styx* arriving at the spot from New Caledonia, early in January 1859, it was found that the whole of the passengers and remainder of the crew, with the exception of one Chinese, had been horribly massacred by the natives. The survivor stated that the natives feasted upon the bodies of their victims.

together, forming small villages near the cocoa-nut groves. At one place, a cleared sloping bank above the shore, showed a succession of small terraces, with a bush-like plant growing in regular rows.

Canoes of various sizes were seen, with an outrigger on one side; one of them was furnished with a large mat sail, of a long oval shape, similar to those already described to the westward.

ADELE ISLET, S.E. by E. $\frac{1}{2}$ E. $9\frac{1}{2}$ miles from cape Deliverance, is low and wooded, and lies on the extreme point of Rossel spit, a reef stretching out from the cape: the outer edge of this reef, after trending S.W. 6 miles from the islet, turns sharply round towards the centre of Rossel island. This, like Rossel reef, to the northward, is impenetrable, so that the only part of Rossel island that is not guarded by reefs, is the western portion of the south coast, which is open to the sea, and during the south-east monsoon is a dangerous lee shore.

ROSSEL REEF is a long narrow barrier, extending from an opening 16 miles W. $\frac{3}{4}$ N. of the West point of Rossel island, to within 6 miles of cape Deliverance, passing about three-quarters of a mile northward of the rock close off the north point of this island. From the opening it first trends N.E. by N. $4\frac{1}{2}$ miles, then nearly in a direct line, E. $\frac{1}{2}$ N. 30 miles, where it takes a sharp turn to the southward, closing the shore at about 6 miles north-westward of cape Deliverance, when it is succeeded by a chain of detached patches, skirting the shore as far as the cape.

Throughout the whole length of this reef not a single opening could be seen, even to admit a large boat, nor could any soundings be obtained outside it, within a cable's length of the edge.

A line of heavy breakers was seen from the mast-head, extending about 18 or 20 miles westward from the S.W. point of Rossel island, and then turning to the northward, nearly meeting the westernmost extreme of Rossel reef. These two barrier reefs enclose an extensive lagoon, with apparently deep water, reaching to the north-western shores of the island; there appeared to be two entrances close together, at the west end of the lagoon, but none could be discovered in any other direction.

The swell experienced from the southward, between Piron island and the west end of Rossel reef, leads to the supposition that there is a navigable channel between Sud-est island and the southern reef, which runs out westward from Rossel island. But no sailing vessel should act upon this supposition, and attempt the opening from the south-eastward during the south-east monsoon, as, in the event of its not proving a clear channel, the vessel would have great difficulty in beating out again.

WINDS and WEATHER.—The winds in the south-east monsoon blow sometimes with considerable force, and constantly along the southern coasts of New Guinea and the Louisiade archipelago, accompanied by a long heavy swell. In this monsoon the higher mountain summits are often enveloped in clouds, and the weather is frequently gloomy and dark, with rain.

In the westerly monsoon the water is smoother, and the most distant objects are remarkably visible; but the winds are changeable, and sometimes there are strong gales, with heavy rain.

The south-east monsoon begins in April, and continues until the end of October.

The westerly monsoon can hardly be said to blow as a steady wind; during Captain Stanley's survey it did not set in until the middle of December, and during January and February the wind was changeable, blowing as often from the East as from the West.

DIRECTIONS.—A ship from the southward and eastward, intending to proceed along the south coasts of the Louisiade archipelago and New Guinea to Bramble cay and Torres strait, should, from the eastward, shape a course so as to make mount Rattlesnake, the highest part of Sud-est island. When 20 miles southward of this mountain, which in clear weather is visible at a distance of 45 miles—and the breakers on the Barrier reef should be seen from the mast-head—steer W. $\frac{1}{2}$ N. 320 miles, to long. 148° E., or until mount Obree, if visible, bears about North: this course will lead 20 miles South of Duchâteau isles, 12 miles South of Ouessant isle, 32 miles South of Cloudy mount, and to 25 miles South of Keppel point.

If the weather be thick, when approaching Sud-est island, the best plan will be to clearly make out the Barrier reefs, and keep them and the low islets between Sud-est island and New Guinea well in sight during the day, when they will serve to mark the ship's position; but this can only be done with a commanding breeze. With light winds and the long swell which rolls on to the back of the reefs, and an uncertain tide stream or current, a good offing should be kept, and at night it will be necessary to keep from 20 to 30 miles southward of the reefs.

From a position about 25 miles South of Keppel point, steer W.N.W. 150 miles, first passing between Hood point and Coutance reef, keeping a good look-out for the latter, as its position is somewhat doubtful. After passing Hood point, a departure should be taken from some of the conspicuous hills of New Guinea; and having run W.N.W. the given 150 miles from abreast of Keppel point, steer West for Bramble cay.

In approaching Bramble cay the lead will give warning, the depth being from 50 to 80 fathoms, coral-sand, at 80 miles to the eastward of it.

Having passed Bramble cay—which may be done on either side—proceed through the Great North-east channel as directed at page 383.

One of the results of Captain Owen Stanley's surveys of the south coast of New Guinea and the Louisiade archipelago, has been the ascertaining the existence of a clear channel of an average breadth of 30 miles, extending from Bramble cay in the north-east entrance of Torres strait, to cape Deliverance. This space was so traversed without any detached reefs being discovered, that it does not seem probable any such exist there, with the exception of Coutance reef. The shores and Barrier reefs already detailed may now be approached with safety, and vessels may run along them by day or night, without the risk of coming upon unknown reefs, such as may exist in other parts of the Coral sea, farther South.

The south and eastern portion of the archipelago having been described, we will next proceed with the description of the several groups of islands and reefs forming the western part, which extends between Teste island and Normanby island, the southern of the D'Entrecasteaux group.

The new route to China, proposed by Captain J. Moresby, R.N., and since examined by Lieutenant Dawson, in 1874, passes through this part of the Louisiade archipelago.

Teste and Lebrun Island and Foolscap Rock have been described at pages 532, 534.

BENTLEY ISLAND, the western extremity of which bears N.N.E. $\frac{3}{4}$ E., $9\frac{1}{2}$ miles from Foolscap rock, is about $1\frac{1}{2}$ miles long East and West and half a mile broad; it is of peculiar shape, and in many respects unlike the other islands in the locality. Its western part is steep, gray cliff, clothed on the summit and west side with rich grass. A deep gorge divides a solitary cliffy hill from the main table-land of the island, the division appearing prominent from the north-west and south-east. Both table-land and detached hill appear about the same height, namely, 350 feet. Off the west point of the island is a detached, conspicuous, pyramid-shaped boulder rock, about 50 feet high. The eastern portion of the island is of low cultivated land, bordered by sand-beach. The village is in a bay on the north-east side, and appeared to be well inhabited; several large canoes were seen hauled up on the beach near it. A coral reef surrounds the island at a distance of three quarters of a mile on the western side, and about the same distance to the south-east, in which direction are several dry sand banks, with bushes upon them.

Soundings of 5 and 10 fathoms were obtained at a cable from the northern edge of the reef, the bottom being uneven coral and sand.

MUDGE ISLAND, lying S.E. by E. $\frac{1}{2}$ E., 4 miles from Bentley island, is three quarters of a mile long N.E. and S.W., low, of coral

formation, and thickly wooded. A coral reef surrounds it, taking the form of a small barrier on its south-west side, where there is a salt water lagoon. It is uninhabited, landing is difficult, and there appeared to be an absence of any birds throughout its woods.

Soundings of 4 and 5 fathoms were found on its western side one quarter of a mile outside the reef, the bottom being composed of uneven coral.

ENGINEER GROUP, $6\frac{1}{2}$ miles eastward of Moresby island, consist of four islands, curving in an E.S.E. and W.N.W. direction; and between these and the small islands south-east of Moresby island is the main route to Göschen strait, at this part about 5 miles wide.

Slade Island, $1\frac{1}{2}$ miles long N.W. and S.E., by about half a mile broad, is the north-western and most conspicuous of the Engineer group. Its summit, about 596 feet high, bears E. $\frac{1}{4}$ N. distant 8 miles from cape Lookout, is well wooded, and situated near the centre of the island. The northern extremity of the island is joined to Butchart islet, and a well-defined green bluff marks its south-west point. A village is situated on its western side, and another on the north-east,—the inhabitants of both were very friendly.

Butchart Islet, connected to the north point of Slade island by a coral reef, is small, of moderate height, and rises to a well-marked hill, about 350 feet high, near its northern end. On the islet is a large grove of cocoa-nut trees, the property of the inhabitants of Slade island, by whom it is called Dekatooa.

Skelton Island is separated from Slade island by a channel 3 cables wide, near the centre of which, but rather nearer Slade island, is a black rock about 20 feet high. Soundings of 16 fathoms were found between this rock and Skelton island, and the water on the northern side of it appeared deep, but was not sounded.

Skelton island is a little more than 2 miles long E.S.E. and W.N.W., and rather more than half a mile broad. Its summit is near the centre of the long broken ridge which traverses its length, and rises to an altitude of about 500 feet. At the north-west end of this ridge is a conical hill of almost the same height as the summit. The western shore of the island has a succession of small sandy bays, with two villages near the beach.

A barrier coral reef, with dry sand patches having bushes upon them, circles round from the south-east point of the island, and, having an opening to the westward, forms a natural camber, which looked deep enough for small craft.

Sandfly Bay, on the west side of Skelton island, affords a confined anchorage, but is partially sheltered in south-east winds. It has depths of

from 15 to 20 fathoms, one third of a mile from its head, with the south point of entrance bearing S.E. A swell sets in with an E.S.E. wind.

Care should be taken not to shoal to less than 15 fathoms, as the shore reef which fringes the bay shoals rapidly, and off the south point is a broken coral bottom, with depths of 4 fathoms one quarter of a mile distant. A village (apparently presided over by a woman) is situated at the head of the bay, and the natives freely exchange the usual produce for iron-hoop.

Water in small quantities can be obtained at a well about 100 yards inland of the village, but it is necessary to carry the casks to and from it, as the narrowness of the track does not allow of their being rolled.

Large, straight-handled knives (commonly termed trade knives), were found in the possession of these villagers; and from imperfect signs they seemed to intimate, that on a former occasion a vessel had visited the bay and kidnapped three men, leaving the knives as payment.

A second village is in a small bay inside the barrier reef just mentioned; it seemed smaller than the first, but was not visited.

Watts Island, the south-eastern of the Engineer group, is rather more than 2 miles long East and West, by 600 yards in breadth. The summit, about 400 feet high, near the western end, is well defined and thickly wooded. Towards the centre the island dips considerably, and near the eastern end rises to a table-land, about 350 feet high, which terminates in steep cliff on the south side. The north shore of the island appears steep-to, but the south has a small beach bordered by a sunken reef, with deep water inside, where several canoes were seen. A large village extends along the inside of this beach, and bore signs of prosperity. The south-east point of the island has a detached fragment of rock, about 20 feet high, a few yards off shore.

The channel between Watts and Skelton islands is three quarters of a mile broad, and in it were found depths of 3 and 4 fathoms, over a bottom of sand and coral. It has generally a strong tide race across it, with the appearance of shoaler water, and not having been thoroughly examined should be avoided.

To the north-eastward of the Engineer group are a string of six small coral islets, similar in appearance, and thickly wooded. The space between these and the Engineer group is generally deep, but beset in parts with patches of coral, rising perpendicularly from the bottom.

Caution.—No vessel should attempt to pass between these islands, except in fine weather, and with a good look-out from the mast-head.

Bright Islet is the northern of the small islets just mentioned. It is of circular shape, and bears from the summit of Slade island N. $\frac{1}{4}$ E., distant $3\frac{1}{2}$ miles.

BRIGHT REEFS are a series of coral patches having upon their depths varying from 3 to 10 fathoms, with deep water between, the whole occupying a space of $1\frac{1}{2}$ miles North and South, by a mile East and West. From the western limit of this foul ground, the centre of Byron islet bears S.W. by W. $\frac{1}{2}$ W., $3\frac{1}{2}$ miles, and the summit of Slade island S.S.E. $\frac{1}{2}$ E. $3\frac{1}{2}$ miles.

Clearing Mark.—The west extremity of Bentley island kept in line with the west extremity of Slade island, is (in clear weather) a good leading mark for passing between these and the Shortland reefs, if taking the main route to, or from, Göschén strait. See page 566.

Deedes Islets, two in number, lie E. $\frac{1}{2}$ N. of Bright islet and in line with each other, three quarters of a mile apart, the western one being nearly 2 miles from Bright islet. An arm of discoloured water, upon which was found soundings of 2 and 3 fathoms, extends from the north end of the western islet towards Bright islet; its western edge was not defined.

From the eastern islet a coral ledge runs to the southward for more than a mile, nearly joining the north end of Pender islet.

Pender Islet lies E.S.E. 3 miles from Bright islet, being similar to it in appearance and formation. Coral reef extends one mile South of its southern point; and from its eastern side a circular reef stretches eastward curving south towards Powell islet. Upon it are some dry sand-banks, on which a few bushes grow.

Powell Islet, S.E. by E., $1\frac{1}{2}$ miles from Pender islet, is surrounded by a coral ledge, which extends from its northern point some distance towards Pender islet. On this ledge are a few small sand patches, which dry.

Messum Islet, S.E. by E. $\frac{1}{2}$ E., $2\frac{1}{2}$ miles from Powell islet, is of coral formation, but higher than any of the islets just described, the tops of the trees upon the small hill at its western end being about 250 feet high. Coral reef extends to the northward of it; and three quarters of a mile N. by E. of its western end is Split rock, about 60 feet high, taking its name from its appearance, the division being most conspicuous when seen from the east or west.

HASZARD ISLETS, of which there are two, are low, and connected by coral reef. The southern is a little more than a mile long N.N.E. and S.S.W., by 400 yards in breadth. At its south end is a remarkable round hill, about 200 feet high. The centre of the islet is flat and sandy, rising gradually at the northern end to a similar, but smaller hill. Flat islet, about a cable south-east of the north-east point of the southern Haszard, rises from the reef, and is small and low.

Button Islet, is a solitary hillock, situated upon the reef, on the western side, and about midway between the two Haszard islets.

North Hazard Islet is low and well-wooded, about three quarters of a mile long North and South, by one quarter of a mile broad. On its western side is a small bay, on the shore of which is a village, possessing a few canoes. Extensive coral reef joins the two principal Hazard islets, upon the eastern face of which the sea breaks heavily.

Night Bank, having as little as 3 fathoms of water upon it, is about half a mile broad, and was seen to extend some distance East and West, its limit not having been determined. It may join the north end of the Hazard islets. From the position of 3 fathoms, the north extremity of the north Hazard bears S.W. by W. $\frac{3}{4}$ W. distant $1\frac{1}{2}$ miles. A heavy tide-ripple generally marks the position of this bank. The tides in this vicinity run at the rate of 2 knots at springs; ebb to the south, flood to the north.

Discoloured Water.—Five separate patches were seen between Hazard islets and Hardman islets (to the northward), the positions of which are approximately placed upon the chart.

HARDMAN ISLETS, of which there are two, lie W.N.W. and E.S.E. of each other, half a mile apart; they are low, and of coral formation, the western being the larger and most conspicuous. Extensive coral reef surrounds them, and blocks up the channel which would otherwise divide them; both are thickly wooded. The western islet lies E. $\frac{3}{4}$ N., $5\frac{1}{2}$ miles from Blakeney islet.

LASEINIE ISLANDS are six in number. The largest, named Dawson island bears N.E. by E. $\frac{3}{4}$ E. easterly from the western Hardman islet, distant $6\frac{1}{2}$ miles. It is about three-quarters of a mile long N.W. and S.E., and rises in the centre to a summit about 450 feet high. When viewed from east or west this summit appears flattened, but if from north or south, conical. The island is rocky, and thickly wooded, having a fringe of coral around its base. No signs of inhabitants were seen, either here or among the other islets of this group.

The two islets South of the one just described, are small, and of coral formation. The one furthest south is about 150 feet high, the other 450 feet. They bear in a line S.E. by E. $\frac{1}{2}$ E. from the summit of Dawson island, distant $1\frac{1}{2}$ and $1\frac{3}{4}$ miles respectively.

The three islets North of Dawson island are also small, and similar to those just described, but of less height. From the summit of the large island they bear N. by W. $\frac{1}{4}$ W., N.W., and N.W. $\frac{1}{4}$ N., distant $1\frac{1}{2}$, 3, and $3\frac{1}{2}$ miles respectively.

An extensive coral reef appears to connect the whole group, having a few dry sand patches upon it immediately north of Dawson island; to the eastward of this, foul ground was found to extend a distance of $1\frac{1}{2}$ miles.

The space south-westward of Laseinie group, and between it and the

Hardman islets, has not been examined. From the mast-head it appeared foul, abounding in discoloured water, indicative of mushroom patches of coral.

BONVOULOIR ISLANDS AND REEFS appear to extend in a slight curve about 20 miles N.W. and S.E.; Hastings island the westernmost bearing E. by N. northerly, about 27 miles from Dawson island. This group appears to have been seen by D'Entrecasteaux in 1793, but do not appear to have been again noticed until 1872, when Captain C. H. Simpson, H.M.S. *Blanche*, passed between them and observed that two of the islands rose in steep cliffs about 200 to 300 feet above the sea. They were flat on the top, and thickly wooded, but did not appear inhabited. A group of coral islands and reefs were also seen to the westward.

BLAKENEY ISLET bears N.E. easterly, 10 miles from Shortland islet, and occupies a central position in the main route to Götschen strait when approaching from the southward. It is oval shaped, of coral formation, low, thickly wooded, and has a sand beach surrounding it. Anchorage in 23 fathoms, sand and coral bottom, was found on its western side, about 2 cables off shore.

A coral ledge extends one quarter of a mile from the south side of Blakeney islet, and a tongue of foul ground, breaking off in patches towards its extremity, runs out South from its southern end to the distance of $1\frac{1}{4}$ miles; also, from the north-west side of the islet, a coral reef extends about one quarter of a mile. Between Blakeney and Hull islets is a middle ground of sunken coral, $1\frac{1}{4}$ miles in extent, north-west and south-east, with a narrow 10-fathoms channel between it and the shore reef of Blakeney islet. The wood of the islet was cut in considerable quantities, and found to mix well with coal for steaming purposes.

HULL ISLET bears N.W. $3\frac{1}{4}$ miles from Blakeney islet, and like that islet, is low, woody, of coral formation, and oval shape. It is half a mile in length, N.W. and S.E., with a narrow strip of sand bordering its shores. Coral ledges project about half a cable from its north and west sides; and from the south end, a coral reef, having upon it 5 fathoms of water, extends one quarter of a mile in a southerly direction.

Grace Islet bears N.W. by W. $\frac{1}{4}$ W., $4\frac{1}{4}$ miles from Hull islet, and is similar to it in appearance and shape, being thickly wooded, small, and of coral formation. Sunken coral reef, having upon it depths of from 3 to 5 fathoms, with probably shoaler water, extends $4\frac{1}{4}$ miles to the south-eastward from the south side of the islet; and from the west side, similar reef, having depths upon it of from one to 3 fathoms, extends $2\frac{1}{4}$ miles westward. The sea was seen to break on the extremity of this latter reef.

Cocked Hat is a conical rocky islet taking the shape which gives its name. It is about 50 feet high, and bears W.S.W. $1\frac{1}{4}$ miles from Grace islet. Coral reefs, upon which the sea constantly breaks, extend westward from Cocked Hat for about $1\frac{3}{4}$ miles.

GALLOWES REEF is an extensive, horseshoe-shaped ridge of coral, the greater part awash, blocking up a space 6 miles long East and West, by $3\frac{1}{4}$ miles broad, near the centre of the eastern entrance to Göschen strait. A few dry spots are visible at low water on the eastern part of the reef, and a sand-bank (about 3 feet dry) is situated near the extremity of the south-west arm; also, on the northern arm, are two small islets named Jack and Ketch, bearing W. $\frac{1}{2}$ N. and E. $\frac{1}{2}$ S. of each other, 2 miles apart; they are small and similar in appearance, each having a scattered growth of small trees. The outside bend of the horseshoe faces the east, and from the west extremity of the southern arm Grace islet bears S.S.E. $\frac{1}{4}$ E. distant 3 miles; from the outside centre of its eastern edge, Hull islet bears S. $\frac{1}{4}$ W. westerly, distant $6\frac{1}{2}$ miles; and from Jack islet, near the western extremity of the northern arm, Lydia island summit bears W.S.W. westerly, distant $7\frac{1}{4}$ miles.

The sea breaks heavily upon the south-east side of Gallows reef, which is steep-to, no bottom being found with 120 fathoms of line at one quarter of a mile distant. A break in the northern arm affords a passage for a boat to the space enclosed within the reef, but the inside, where sounded, appeared to abound in coral knolls.

Caution should be used in approaching this part of Göschen strait, as the tides set strong in the vicinity, and the lead gives no warning of the approach to dangers.

LYDIA ISLAND, the summit of which, 1,034 feet above the sea level, affords a prominent mark in approaching Göschen strait, is about 3 miles long, and about the same broad, irregular in shape, and deeply indented. A range of hills traverses the extreme length and breadth of the island, and to the south forms a narrow, razor-backed, tail-like peninsula. The summit of the island is near the northern part, regular in outline, of rounded conical shape, and wooded with trees of small size.

A small bay on the north side of the island affords anchorage in 19 fathoms in its south-west corner, but within half a cable of the edge of the coral reef, which, rising abruptly, borders the shores of the bay. This position is exposed to north-easterly squalls which are sometimes experienced. Off the north-west point of the island a sunken coral reef runs in a N.N.W. direction for a distance of 7 cables towards Charlie islet; and the northern shores of the island generally, are fringed with coral reef to the distance of 2 cables from the shore.

The principal village is situated in the bay on the north side of the island, and appeared well inhabited. Although possessed of an average quantity of cocoa-nut trees and cultivated land, supplies were found to be scarcer here than at Moresby and other islands to the southward.

Stanwell Island is small, hilly, and separated from the north-east part of Lydia island by a narrow navigable channel, which should not be attempted without local knowledge. Its summit, about 290 feet high, is clothed with grass, and does not appear prominent. A few huts are grouped together near the beach on the north-west side of the island. Coral reefs extend from its north, east, and south sides,—that to the south takes a southerly direction, and is about three quarters of a mile long, and awash at low water,—that to the east extends half a mile in an easterly direction,—and that to the north in a northerly direction 3 cables. Between the coral reefs extending off Gibbons and Stanwell islands the dark colour of the water indicates a channel, but it was not sounded.

Gibbons Island lies S.E. $\frac{3}{4}$ E. $2\frac{1}{4}$ miles from the summit of Lydia island; it is conical, 385 feet high, thickly covered with grass from base to summit, and fringed by a coral reef which extends in a tongue one mile to the southward, and half a mile to the eastward. When approached from the southward, Gibbons island affords an excellent landmark, its bright green summit being seen from a considerable distance. The island is not inhabited.

Shoals.—Parallel to Gibbons and Stanwell islands, and to the eastward, a bank of sunken coral extends $2\frac{1}{4}$ miles in a N.N.W. and S.S.E. direction, having upon it depths of from 6 to 12 feet. Between it and the above-mentioned islands is a channel about three quarters of a mile broad, through which H.M.S. *Basilisk* passed on several occasions, but it is inferior to the channel of the main route north-eastward of the Gallows reef.

South-westward of Lydia island, at distances varying from one to 6 miles, are several detached mushroom patches of coral, and sand banks, many of which break; they are steep-to, no bottom with 60 fathoms of line, being obtained in the vicinity. This locality should be avoided, but if a vessel be compelled to pass among them, a sharp look-out should be kept from the mast-head.

OBSTRUCTION ISLANDS take their name from the position they occupy, blocking the passage between Lydia island and East cape; they are three in number, the middle one being highest and most conspicuous.

The northern island is about three quarters of a mile long East and West, and has a broad summit about 230 feet high; it is well wooded, and has a

small village on its western side. It bears from Lydia island summit W. $\frac{1}{4}$ S., distant 5 miles. On its eastern side is a small sand-spit ; and a sand-bank, which is dry about 2 feet above high water, lies E. by S. $\frac{1}{4}$ S., distant half a mile from the east point of the island.

The middle island has a conical-shaped, well-wooded summit, 367 feet high, bearing S. by W. $\frac{1}{4}$ W., distant $1\frac{1}{2}$ miles, from the summit of the northern island. From its northern point a coral reef, with rocks which dry at low water, extends nearly half a mile in a northerly direction.

The south island is much smaller than the other two of the Obstruction group, and is about 150 feet high. Its summit bears S.E. from the summit of the north Obstruction island, from which it is distant 3 miles.

Caution.—The space between East cape, Lydia island, and Obstruction islands, abounds in coral reefs and foul ground, and should be carefully avoided.

Charlie Islet is small and sandy, and shaped like a crescent with a few scattered trees growing upon it. Coral ledges extend about one cable North of its north point, and 3 cables South of its south point. The centre of the islet bears N.W. $\frac{1}{4}$ N., distant $2\frac{1}{4}$ miles, from the summit of Lydia island.

Two small detached coral knolls, close together, and having a depth of about 6 feet upon them, are situated N.E. by E., 7 and 9 cables from the north point of Charlie islet.

Flounder Reef is a detached coral patch 3 cables in extent, having a depth of about 12 feet ; from its centre, Lydia island summit bears S.W. $\frac{1}{4}$ S., distant $2\frac{1}{2}$ miles. This danger can generally be detected at a distance of $1\frac{1}{2}$ miles, unless the weather be calm, and the sun low.

GÖSCHEN STRAIT is formed between Grind reef and the south coast of Normanby island (the southern of D'Entrecasteaux group) on the north, and East cape of New Guinea, Lydia island, and Jack and Ketch islets, with the Gallows reef, on the south ; it is about 16 miles in length, East and West, and varies in breadth from 2 to 6 miles. On its northern shore the Prevost range of mountains, upwards of 3,000 feet in height, and covered with dense tropical forest, descends in steep slopes to the water's edge, being intersected by numerous ravines. About the centre of this range, or nearly midway between capes Prevost and Ventenat, a remarkable dip or gap occurs, the position of which is accurately placed upon the chart, and will be found an unmistakable mark for fixing a vessel's position in cloudy weather, when passing through the strait.

TIDES.—It is high water, full and change, in Göschén strait at about 8 hours. The rise and fall is apparently not more than 5 feet. Between Grind reef and Gallows reef, the flood sets W. by N., the ebb E. by S.,

following the direction of the strait. The ebb appears the stronger tide, attaining at springs a rate of 2 knots an hour.

CAPE VENTENAT (of D'Entrecasteaux), the south-east point of Normanby island, bears N.E. by E. $\frac{1}{4}$ E., easterly, from the summit of Lydia island, distant nearly 13 miles. The Prevost range here slopes more gradually towards the sea, forming in cape Ventenat a wedge-shaped point, well defined when seen from the east and west. A narrow strip of sand beach encircles the cape, and a ledge of coral extends about 2 cables to the southward of it.

Ventenat Islands are small and woody, but with well-marked summits. They bear S.W. $\frac{1}{4}$ S. and S. $\frac{1}{4}$ W. from cape Ventenat, and are each distant from that cape about three quarters of a mile. From each other their bearing is N.W. by W. and S.E. by E., 3 cables apart; the eastern being about 250 feet high, the western 200 feet. A coral reef, upon which the sea often breaks, joins them, and extends about 6 cables westward of the western island.

• A barrier reef of sunken coral skirts this part of the coast of Normanby island, outside Ventenat islands, curving gradually to the north-east, and having depths of from 5 to 18 feet upon it. Its south-west extremity (Grind Reef), between which and Gallows reef is the broadest passage through Göschen strait, has a depth upon it of 15 feet, and bears N.E. $\frac{1}{4}$ E. from Jack islet distant $2\frac{1}{4}$ miles, and N. $\frac{1}{4}$ W. from Ketch islet distant 2 miles. A small sand-bank which is dry at high water is situated on this barrier reef, in line with Ventenat islands, from the eastern one of which it bears E. $\frac{1}{4}$ S. distant half a mile. Inside this reef depths of 24 fathoms were found, and deep water appears to extend along the east coast of Normanby island inside it, as far as 3 miles North of cape Ventenat.

The east coast of Normanby island was seen to extend in a N.N.E. direction for about 10 miles, at which distance from cape Ventenat the eastern summit of the coast range appeared as a lofty, wedge-shaped mountain. The shores of this part of the coast seemed to be deeply indented, and many canoes from this locality came round cape Ventenat to visit the ship. A small islet with a prominent tree upon it was seen off one of the points, about 5 miles N.N.E. of cape Ventenat.

Centipede bay, $2\frac{1}{4}$ miles N.W. of cape Ventenat, is a bight, open to the southward, and affording deep water anchorage for a steam vessel. At its head this bay is about half a mile across East and West, and has a smooth sand-beach, fronting a lagoon, the water of which is fresh and sweet when the tide is low. The village stands upon a brow of a hill on the eastern side of the bay, and appeared more compact and better built than most of the villages in the islands to the southward.

Anchorage was obtained by H.M.S. *Basilisk* in 26 fathoms, stiff muddy bottom, about a cable from the shore, and one quarter of a mile from the eastern end of the beach. Westward of this position no bottom could be obtained with 40 fathoms of line.

The Natives here are similar in appearance and manner to those of Moresby island, but seem healthier and better fed. Large quantities of yams were easily procured, and other supplies of fruit of the same description as at Moresby island were bartered for iron-hoop.

The COAST.—A point, $1\frac{1}{4}$ miles westward of Centipede bay, juts into Göschen strait, and has a small coral ledge extending off it. To the north-east of this point, and between it and Centipede bay, is another small deep water bay, similar in aspect to the former. The south coast of Normanby island westward of this continues steep and without marked features for 3 miles, when another point having a small coral ledge extending off it, slightly projects; it bears W. by N. from the salient point just described, distant 3 miles. Thence to cape Prevost the coast continues its W. by N. direction for 9 miles in almost a straight line, and is steep-to, no bottom with 60 fathoms of line being generally had at less than a mile from the coast.

CAPE PREVOST, the south-west point of Normanby island and north-west limit of Göschen strait, is well defined and steep. From East cape of New Guinea cape Prevost bears N.N.E. $\frac{1}{4}$ E., distant nearly 9 miles. The Prevost range rises above it at a steep angle to a conical peak appearing rounded from the south-east. A deep gorge divides a second peak of similar appearance from the first, but unless seen from a distance of about 5 miles the two appear blended in one. Soundings of 120 fathoms, no bottom, were found at one quarter of a mile southward of cape Prevost, which, with other deep soundings in the same vicinity, clearly points out that this part of the coast of Normanby island is also steep beneath the water, as it is seen to be above.

WINDS.—In February and March 1873 calms and variable winds were experienced, with fine clear weather. Occasionally a fresh breeze from the south-east prevailed for two or three days succeeded by calms and light winds. Excepting two or three days the weather was always dry.

In the same months of 1874 more wind and rain were experienced, the westerly monsoon with unsettled weather being felt from the middle of February to the 11th of March. After which, easterly breezes with sometimes calm and clear weather were felt; then after a few days of unsettled rainy weather with strong E.S.E. breezes it again became fine with light and variable winds, generally from the northward, until the 29th April, when the *Basilisk* left the vicinity of East cape for the west-

ward. From April to October a steady south-east monsoon blows on the east and north-east coasts of New Guinea.

Temperature.—From February to May 1873 the thermometer ranged from 82° to 88°, but the heat was rarely oppressive.

DIRECTIONS.*—Vessels from the south-east coast of Australia bound to Göschen strait or to the eastern islands of New Guinea, will do well to pass westward of Cato, Wreck, and Kenn reefs, and eastward of Saumarez and Frederick reefs. Care should be taken to make Teste island by day, and if within 60 miles, and overtaken by night, the navigator should shorten sail until daylight, as the current was found in the month of February, during a strong westerly gale, to set E.N.E. $2\frac{1}{2}$ knots an hour, or directly on to the reefs southward of Teste island. Both Bell rock (420 feet high) and Teste island afford good land marks, as the latter can generally be seen at a distance of 18 or 20 miles. From the southward Teste island first appears as three or four detached islands, and on nearer approach two remarkable trees will be seen on one of the ridges, but if the weather be thick, Stuers islets which are low and woody, may be the first land sighted; and it is possible that the high land of Moresby island (1,300 feet high) may be seen looming in the distance, previous to sighting any of the above-mentioned islands.

Vessels may pass between Suckling reef and Stuers islets, and across the sunken Barrier in from 9 to 10 fathoms, with the high Lebrun islet on a N.N.W. $\frac{1}{4}$ W. bearing. If the vessel have passed to the westward of Suckling reef, the larger Lebrun islet should not be brought to bear eastward of North, as the tides and eddies run strong on the bank south-westward of Lebrun islets. The passage south-east of Teste island should be avoided, as a depth of 4 fathoms was here struck, and it has not been sufficiently examined.

Having crossed the sunken Barrier, steer to pass about a mile westward of Bell rock, after passing which, a N.N.E. course should be steered (allowing for set of tide) to pass a mile east of Glenton and Smith islets: if requisite, anchorage may be found in 9 fathoms on the bank of sand which extends about 2 miles to the northward of Foolscap rock.

After passing Glenton and Smith islets, a North course should be steered, and if the weather be fine the west extremity of Slade island, in line with the west extremity of Bentley island, is a good mark for continuing upon (*see* page 558), until Shortland island bears S.W. by W. $\frac{1}{2}$ W., or until the southern Hardman islet is in line with the south point of Dawson island bearing N.E. by E. $\frac{1}{2}$ E.; the latter mark will lead clear of the foul ground to the south of Blakeney island.

When Blakeney islet bears N.W. by W., a N. by W. $\frac{1}{4}$ W. course will

* Captain John Moresby, R.N., H.M.S. *Basilisk*, 1874.

lead up to the passage between Grind reef and Gallows reef, care being taken to ascertain the ship's position by cross bearings, as the tides set strong to the east and west in this part of Göschen strait. When the north point of Lydia island is seen between the Jack and Ketch islets, and bearing W. by S. southerly, a W. $\frac{3}{4}$ N. course will lead in mid-channel to Göschen strait between the reefs, clear of danger.

Gibbons Island Route is only recommended for steam vessels and for small sailing vessels during fair weather; but this route has the advantage of entering Göschen strait to the west of Gallows reef and Grind reef. Having passed to the eastward of Glenton and Smith islets, a mid-channel course between Shortland and Grant islands should be steered, avoiding the 3-fathoms patch N.W. $\frac{1}{2}$ N. of point Lookout (page 526), bearing in mind that the tides are strong and tide rips heavy. The vessel should maintain a speed of at least 4 knots, and be conned from aloft.

To clear Mid Sand bank, which dries 4 feet, steer for the remarkable gap in Prevost range bearing North until Hull island bears East, after which a course should be shaped to pass about one quarter of a mile to the eastward of Gibbons island, the passage between that island and the reefs eastward of it being only half a mile wide, and there being no anchoring ground. Flounder reef may be passed on either side, and a course may then be steered to clear cape Prevost.

H.M.S. *Basilisk* passed through the above-mentioned route, and also passed between Gibbons and Lydia islands, but this channel is more intricate than the one eastward of Gibbons and Stanwell islands, and is therefore not recommended.

Tides.—The tides are irregular, and appear to be greatly influenced by the direction and duration of the wind. Between Teste island and the southern entrance of China strait, the direction of the stream became deflected to the eastward and westward. Between Smith islet and Engineer group less tidal influence was observed. It is probable that in no part of the Main route to and through Göschen strait does the rate of the tidal streams exceed $2\frac{1}{2}$ miles an hour.

In the vicinity of Blakeney islet the flood stream sets N.W. the ebb S.E.

Soundings.—To the northward of Smith islet and between that islet and Shortland reefs, depths of 29 to 50 fathoms were found; to the north-eastward of Shortland reefs, and in the direction of Hardman islets, no bottom with 35 fathoms; and a mile south-west of the western or larger Hardman, 300 fathoms, coral bottom. Midway between the Hardman islets and Gallows reef (the middle danger of Göschen strait), a cast was got of 500 fathoms, over a bottom of yellow ooze; between Gallows and Grind reefs, 120 fathoms, no bottom; and westward of these reefs, mid-channel between the south coast of Normanby and

Lydia islands, 510 and 570 fathoms were found, the bottom in both cases being a mixture of yellow sand and mud.

Natives.—The natives of the south-east parts of New Guinea and adjacent islands in appearance are copper coloured, averaging five feet three inches in height, of a light active build, often with good features which they paint; but the men's teeth and mouths are much disfigured by constant use of the betel nut. The hair is usually worn frizzled out into a huge mop and ornamented with feathers. The women's hair is always cut short. Both sexes were almost naked. Their weapons appear to be wooden spears and swords, clubs, slings, and stone V-shaped hatchets, but no bows and arrows were seen amongst them. Caution is requisite in dealing with these people, as they are much inclined to pilfer; in some places they are trustworthy and friendly, but it is necessary to be armed on all occasions. Occasionally, human jaw and spinal bones are worn as bracelets and ornaments. They appeared to take pleasure in making it understood that they had eaten the original owners of the bones; but these, as well as the few skulls exhibited in their villages, appeared to be of an ancient date.

The houses are built after the Malay fashion, on poles raised five or six feet from the ground, and consist of one large apartment with peaked gable ends and a saddle roof. Dogs, cats, and pigs, are kept; also tame cassowaries, birds, and a small species of opossum bear, as pets.

Their plantations are very extensive, and carefully terraced on the mountain sides. Abundance of yams of the finest quality, taro, bananas, sugar cane, apples, Indian corn, and other tropical fruits are everywhere to be found.

All their villages have a vast number of cocoa-nuts hung up on poles, on trees, and every other available place, probably as a propitiatory offering. No other sign of religious worship was seen amongst them.

Their fishing nets are precisely similar to an English seine, with shell sinkers and light wood floats, and vary from one to 20 fathoms in length. The material is made by the women from the fibre of a small nettle-like plant, and possesses the strength of ordinary seining twine.

D'ENTRECASTEAUX ISLANDS.

NORMANBY ISLAND, (*see* page 564,) the southern of the group, is apparently 39 miles long N.W. by W. and S.E. by E., and from 2½ to 16 miles broad, but the eastern coast has not yet been properly examined. From cape Prevost, the south-west point, the coast takes a sharp turn at right angles, and at 6 miles farther north, forms Massie bay, which

abounds in coral patches, and which has only been cursorily examined. The coast range of hills dips considerably near the centre of Massie bay, increasing again in altitude as Double peak is approached.*

CAPE CHESTERFIELD, 7 miles N.W. $\frac{3}{4}$ N. of cape Prevost, is rounded, and of moderate height. To the north-east of it the coast runs in to what appeared to be a narrow inlet with islets in the foreground, but upon nearer approach coral reefs stopped the way, and a boat sent to examine reported no anchorage.

Twin Islets, about a cable apart, are small and button-shaped, and covered with small trees. To the south-westward of them, and between them and cape Chesterfield, a continuation of discoloured shoal-looking water was seen.

After cape Chesterfield is passed the coast trends north-west, and then north, forming a succession of small bays without villages to Duchess cove, distant 5 miles. The coast range continues level and of moderate height, with a thick covering of trees.

Duchess Cove is a small bight about 4 cables deep by one broad, but lessened in anchorage area by shallow banks which line its shores. It affords anchorage in about 22 fathoms over a muddy bottom for a small vessel. H.M.S. *Basilisk* anchored here and remained two days, but during strong north-westerly winds it is advisable to anchor farther out.

The shores of the cove are lined with mangrove and thickly wooded. A small river discharges itself at the head of the cove, the water in it is brackish for some distance up, and watering in ships' boats impracticable. A large number of pigs and a few cocoa-nuts and yams were purchased from the natives for iron-hoop; vegetable produce seemed scarce.

Duchess Islet, lying N.W. $\frac{1}{4}$ N. $11\frac{1}{4}$ miles from cape Prevost, and $1\frac{3}{4}$ miles off the coast, has a circular horn of coral reef extending for about 3 miles to the southward, the sea upon the southern extremity of which was seen to break; also to the northward of the islet detached patches of coral were seen, having a channel about one mile wide, and 58 fathoms of water in it, between them and the coast of Normanby island. The islet is thickly wooded with dark trees, and has a flat saddle-shaped top, rising to a small hill at either end, that to the westward being the higher, and almost 200 feet above the sea level. A narrow strip of coral sand beach borders the northern and eastern shores of the islet, but landing looked difficult.

The Coast of Normanby island from Duchess cove continues in a north-north-westerly trend, forming an extensive bay to which the name

* See Admiralty chart:—Australia, Coral sea and Barrier reefs, No. 2,764.

of Perry was given, having numerous small indentations, to Perry islet, which is small, low and flat, and appeared to be joined to the shore.

The main ridge of Normanby island, after dipping considerably and becoming somewhat level in Massie bay, again rises towards the middle of Perry bay to a conspicuous double peak about 2,700 feet in height, thickly clothed with dark-coloured trees, and affording an excellent landmark.

SUNKEN CORAL PATCHES extend in a direction nearly parallel to the coast between Duchess islet and cape Deedes, and vary in distance from the shore from $1\frac{1}{2}$ to 4 miles.

The positions assigned to them upon the chart must be considered as approximate only, and it is probable that others exist extending farther westward. It is therefore recommended to avoid approaching the west coast of Normanby island nearer than 8 miles.

CAPE DEEDES is a dark thickly-wooded point, situated N.W. $\frac{3}{4}$ N. $10\frac{1}{2}$ miles from Duchess islet.

No bottom with 17 fathoms of line could be found one mile from this cape, nor were any dangers seen at 2 miles westward of this position, or 3 miles westward of the cape.

The northern mountain of Normanby island rises in the form of a blunt cone, with a small double notched summit, 3,374 feet above the sea, immediately over cape Deedes. This summit is similar in appearance to the double peak before described, having a notched or double summit, both rising from the main ridge or backbone of Normanby island, which ridge makes a considerable dip between them.

Observation Islet.—The southern rock off the south point of this islet, situated in latitude $9^{\circ} 43' 53''$ S., and longitude $150^{\circ} 44' 43''$ E., bears N.N.W. $\frac{1}{4}$ W. distant 4 miles from cape Deedes. The islet is small, steep, rocky, and thickly wooded. A ledge of sunken coral connects it with a projecting point of Normanby island, and a detached discoloured patch, the position of which is approximately known, bears from it S.W. $\frac{1}{4}$ W. distant $1\frac{1}{2}$ miles. Between Observation islet and cape Deedes the coast forms a shallow bay, without villages, the hills descending somewhat steeply to the sea, their sides being clothed with dense tropical forest.

CAPE DAWSON is the northern point of Normanby island, and is a well-marked bluff, with deep water within a mile of the shore. The extremity of the cape bears N.N.E. $\frac{1}{4}$ E., distant $1\frac{1}{2}$ miles from Observation islet, and forms the south point of entrance to Dawson strait, dividing Fergusson from Normanby island.

The northern slope of the lofty northern double peak of Normanby island, previously described, terminates at cape Dawson.

The North-east Coast of Normanby island trends from cape Dawson in an E. by S. direction for $8\frac{1}{2}$ miles, to a point immediately abreast Goulvain island, and is for the most part steep-to, with a narrow fringe of coral reef bordering the shore.

Anchorage was found by the *Basilisk* on this coast about $2\frac{1}{2}$ miles eastward of cape Dawson, and about a cable south-eastward of a projecting tongue of coral, which has a black-headed rock dry at all times of tide showing upon its northern centre.

Water.—Near this anchorage a small stream of excellent water discharges itself into the sea, and no difficulty was found in procuring a large supply. Abundance of wood of a description suitable for mixing with coal for steaming purposes was cut at a convenient distance from the sand beach, which marks the position of the mouth of the stream. Many villages were seen upon the spurs and summits of the hills overlooking the anchorage, some at a great height, but the natives were shy.*

DAWSON STRAIT divides Normanby from Fergusson island and varies in breadth from about a half, to $2\frac{1}{2}$ miles. It was not sounded or closely examined, but Captain Moresby, who steamed along its southern shore in a boat as far as Harris islet, was of opinion, from the appearance of the reefs seen off Goulvain and Kempe islands, which are situated near its eastern part, that navigation through it would be dangerous and intricate.

Goulvain Island, situated 10 miles E. by S. of cape Dawson, has a brown bare-looking summit, and is about 2 miles long, North and South, by about $2\frac{1}{2}$ miles broad. Its shores were not examined, but it is inhabited, as many canoes were seen to put off from its shores.

Kempe Islands are two in number, small, and connected by coral reef. They lie $1\frac{1}{2}$ miles North of Goulvain island, and it is probable that they are connected to the latter by a coral reef.

FERGUSSON ISLAND, the largest of the group, lies north-west of Normanby island, and, as stated, is only separated by a narrow strait; it is about 32 miles long N.W. $\frac{1}{2}$ W. and S.E. $\frac{1}{2}$ E., and 24 miles broad, narrowing to a point at either end.

Cape Doubtful, indistinctly seen, appeared as a tongue-shaped promontory, jutting out from the south-eastern shores of Fergusson island, of moderate height, and bearing about N.N.E., 7 miles from the northern-

* Near the mouth of the stream just mentioned some bags of coal, tins of preserved meat, and biscuit, were buried for a boat which had overstayed the period of intended absence from the ship, the trees were blazed to point out the position, and it would be interesting to know, should a vessel visit these parts, whether the natives have disturbed the locality, and to what extent.

The principal village is situated in the bay on the north side of the island, and appeared well inhabited. Although possessed of an average quantity of cocoa-nut trees and cultivated land, supplies were found to be scarcer here than at Moresby and other islands to the southward.

Stanwell Island is small, hilly, and separated from the north-east part of Lydia island by a narrow navigable channel, which should not be attempted without local knowledge. Its summit, about 290 feet high, is clothed with grass, and does not appear prominent. A few huts are grouped together near the beach on the north-west side of the island. Coral reefs extend from its north, east, and south sides,—that to the south takes a southerly direction, and is about three quarters of a mile long, and awash at low water,—that to the east extends half a mile in an easterly direction,—and that to the north in a northerly direction 3 cables. Between the coral reefs extending off Gibbons and Stanwell islands the dark colour of the water indicates a channel, but it was not sounded.

Gibbons Island lies S.E. $\frac{1}{4}$ E. $2\frac{1}{4}$ miles from the summit of Lydia island; it is conical, 385 feet high, thickly covered with grass from base to summit, and fringed by a coral reef which extends in a tongue one mile to the southward, and half a mile to the eastward. When approached from the southward, Gibbons island affords an excellent landmark, its bright green summit being seen from a considerable distance. The island is not inhabited.

Shoals.—Parallel to Gibbons and Stanwell islands, and to the eastward, a bank of sunken coral extends $2\frac{1}{4}$ miles in a N.N.W. and S.S.E. direction, having upon it depths of from 6 to 12 feet. Between it and the above-mentioned islands is a channel about three quarters of a mile broad, through which H.M.S. *Basilisk* passed on several occasions, but it is inferior to the channel of the main route north-eastward of the Gallows reef.

South-westward of Lydia island, at distances varying from one to 6 miles, are several detached mushroom patches of coral, and sand banks, many of which break; they are steep-to, no bottom with 60 fathoms of line, being obtained in the vicinity. This locality should be avoided, but if a vessel be compelled to pass among them, a sharp look-out should be kept from the mast-head.

OBSTRUCTION ISLANDS take their name from the position they occupy, blocking the passage between Lydia island and East cape; they are three in number, the middle one being highest and most conspicuous.

The northern island is about three quarters of a mile long East and West, and has a broad summit about 230 feet high; it is well wooded, and has a

small village on its western side. It bears from Lydia island summit W. $\frac{3}{4}$ S., distant 5 miles. On its eastern side is a small sand-spit; and a sand-bank, which is dry about 2 feet above high water, lies E. by S. $\frac{1}{4}$ S., distant half a mile from the east point of the island.

The middle island has a conical-shaped, well-wooded summit, 367 feet high, bearing S. by W. $\frac{3}{4}$ W., distant $1\frac{1}{2}$ miles, from the summit of the northern island. From its northern point a coral reef, with rocks which dry at low water, extends nearly half a mile in a northerly direction.

The south island is much smaller than the other two of the Obstruction group, and is about 150 feet high. Its summit bears S.E. from the summit of the north Obstruction island, from which it is distant 3 miles.

Caution.—The space between East cape, Lydia island, and Obstruction islands, abounds in coral reefs and foul ground, and should be carefully avoided.

Charlie Islet is small and sandy, and shaped like a crescent with a few scattered trees growing upon it. Coral ledges extend about one cable North of its north point, and 3 cables South of its south point. The centre of the islet bears N.W. $\frac{1}{4}$ N., distant $2\frac{1}{2}$ miles, from the summit of Lydia island.

Two small detached coral knolls, close together, and having a depth of about 6 feet upon them, are situated N.E. by E., 7 and 9 cables from the north point of Charlie islet.

Flounder Reef is a detached coral patch 3 cables in extent, having a depth of about 12 feet; from its centre, Lydia island summit bears S.W. $\frac{1}{4}$ S., distant $2\frac{1}{2}$ miles. This danger can generally be detected at a distance of $1\frac{1}{2}$ miles, unless the weather be calm, and the sun low.

GÖSCHEN STRAIT is formed between Grind reef and the south coast of Normanby island (the southern of D'Entrecasteaux group) on the north, and East cape of New Guinea, Lydia island, and Jack and Ketch islets, with the Gallows reef, on the south; it is about 16 miles in length, East and West, and varies in breadth from 2 to 6 miles. On its northern shore the Prevost range of mountains, upwards of 3,000 feet in height, and covered with dense tropical forest, descends in steep slopes to the water's edge, being intersected by numerous ravines. About the centre of this range, or nearly midway between capes Prevost and Ventenat, a remarkable dip or gap occurs, the position of which is accurately placed upon the chart, and will be found an unmistakable mark for fixing a vessel's position in cloudy weather, when passing through the strait.

TIDES.—It is high water, full and change, in Göschén strait at about 8 hours. The rise and fall is apparently not more than 5 feet. Between Grind reef and Gallows reef, the flood sets W. by N., the ebb E. by S.,

and 12 miles broad; the eastern side has not yet been examined. Its summit, which rises a little south of the centre, is a massive mountain (Goodenough) surmounted by a rounded peak about 7,000 feet high. There are several villages on the belt of alluvial land which encircles the foot of mount Goodenough; the natives were friendly when visited.

CAPE WATTS, the south-east extremity of Goodenough island, is the south-western point of entrance to Moresby strait, and bears from cape Mourilyan of Fergusson island N.W. $\frac{3}{4}$ W., distant $10\frac{1}{2}$ miles. A fringe of coral reef borders the point.

Breakfast cove on the south coast, about $3\frac{1}{4}$ miles westward of cape Watts, is small and sheltered. There are sunken coral patches at its entrance, at 3 cables from the shore.

The South Coast of Goodenough island then extends nearly straight in a north-westerly direction for 11 miles to cape Ryley. At a mile from the coast, coral patches were seen, the positions of which are only approximately known. To the distance of about a mile inland, a belt of well-cultivated land runs along the coast.

Cape Ryley is the south-west extremity of Goodenough island, and bears from cape Vogel (north-east coast of New Guinea) N. by E. $\frac{3}{4}$ E., distant 16 miles. It appeared bold and steep, with small sunken coral patches about a cable from the shore.

CAPE RAWLINSON is the western point of Goodenough island, and bears from cape Ryley N. by W. $\frac{1}{2}$ W., distant about $5\frac{1}{2}$ miles. It is abrupt and bold, but a sunken coral reef was seen extending from it in a W. by S. direction, fully 3 miles.

The West Coast of Goodenough island takes a N.E. by N. direction from cape Rawlinson for about 14 miles, and appears to maintain its bold precipitous nature, being backed by the high lands leading up to mount Goodenough.

The northern and eastern shores of Goodenough island were not visited.

Needham Point, on the east side of Goodenough island, is situated about $4\frac{1}{2}$ miles N. by E. of cape Watts.

NORTH-EAST COAST OF NEW GUINEA.—FROM EAST CAPE
TO CAPE KING WILLIAM.

From East cape the northern shore of the tail-like peninsula which forms the extreme east end of New Guinea, is rocky and steep, and comprises several small bays to Basilisk point. The water in these bays is very deep, and affords no anchorage.

Basilisk Point bears W. by S. $\frac{1}{4}$ S. distant $10\frac{1}{4}$ miles from East cape, and immediately over and to the southward of it, rises mount Killerton.

Bentley Bay between Basilisk point and cape Ducie, affords an indifferent anchorage, the water being very deep close to the shore. Anchorage was found in 15 fathoms, sand, to the eastward of a coral sand bank about a mile from the western shore; with northerly winds this position would be insecure. The land rises precipitously in a series of densely wooded hills, separated from each other by deep gorges and narrow valleys, here and there opening out into small plains as they approach the shore. The inhabitants are numerous, and showed a friendly disposition; they acted as guides to the top of the neighbouring hills, and supplied pigs and yams, in exchange for scrap-iron. These people have extensive plantations of yams, bananas, sago, and Indian corn, in the valleys and on the hill sides extending back from the sea.

CAPE DUCIE is low, rocky, and thickly wooded, and bears from Basilisk point W. by N. $\frac{1}{4}$ N., distant $6\frac{1}{4}$ miles. The foliage of the trees is of darker colour than that of the woods clothing the heights of Stirling range, and this part of the coast makes like an island from the eastward. There was no bottom at 65 fathoms a few boat's lengths North of cape Ducie; but to the eastward, a sunken coral reef extends to a distance of nearly a mile, having a small dry coral bank upon it. Coral reef also extends to the southward, blocking up the western entrance to Annie inlet, and joining Catharine island to cape Ducie.

Annie Inlet lies between Bentley bay and cape Ducie, and extending in a south-westerly direction, appeared to be about 2 miles deep, by three quarters of a mile broad. In the entrance to the north-east is Catharine island, low and covered with mangrove trees. The shores of the inlet generally appeared bordered with mangrove swamp, and the entrance southward of Catharine island was narrowed by coral ledges extending off either shore. The inner part of the inlet was not explored, but it is probably blocked with sunken coral reefs. In mid-channel between Catharine island and the south point of entrance there is a depth of 20 fathoms.

Excellent Point bears W. $\frac{1}{2}$ N., $2\frac{1}{2}$ miles from cape Ducie, and is similar to it in appearance; a small bay having its shores lined with mangrove swamp lies between. Westward of Excellent point, the north-east coast of New Guinea forms Chads bay about 2 miles deep, it then takes a W. by N. $\frac{1}{2}$ N. trend to a somewhat prominent point for 15 miles, after which it continues without change of feature to the bold headland called cape Frere.

Chads Bay has a very picturesque appearance, and many villages. After passing this bay, and at about 5 miles W. by S. $\frac{1}{4}$ S. of Excellent point, is a prominent cliff; and in the interior, standing out towards the coast from the Stirling range, are two remarkable pinnacle peaks, which appear conspicuous from the eastward.¹

The Stirling Range continues to increase in altitude to the westward, and at cape Frere the mountains were estimated to be between 3,000 and 4,000 feet in altitude. Their aspect was different after passing Excellent point, the slopes facing the sea becoming clothed with grass, the summits being thickly wooded, and at the base, a broad belt of cultivated land extending to the sea coast.

Numerous cascades and watercourses are seen running down the mountain sides as cape Frere is approached.

CAPE FRERE, bearing W. $\frac{3}{4}$ N., distant 25 miles from cape Ducie, and S.W. $\frac{1}{4}$ W. distant 39 miles from Observation islet of Normanby island, is a bold, steep bluff, rising to a round whale-backed summit, about 3,000 feet high. The sides of the mountains of this headland are clothed with rich grass, intersected with numerous ravines running parallel to each other, with such regularity as to appear artificial, and in the hollows of the deeper of these, water was seen to course down into the sea.

Soundings.—Between Excellent point and cape Frere the coast seemed clear. At $3\frac{1}{2}$ miles off-shore the depth was found to be 760 fathoms, over a bottom of green mud; and within half a mile of the beach, soundings were seldom had with 60 fathoms of line.

The sea in this vicinity is very deep, 100 fathoms with no bottom being found half a mile to the northward of cape Frere, which is steep-to, and without coral reef.

Bartle Bay, a considerable bight, extending in a southerly direction immediately westward of cape Frere, is about 4 miles long, and $1\frac{1}{2}$ miles deep. A small river, not navigable for boats, disembogues in its south-west corner. No good anchorage could be found here. At the head of the bay, the depth was 49 fathoms. Half a cable outside this position, no bottom could be obtained with 80 fathoms of line. There are no outlying coral reefs in Bartle bay.

The country at the back of Bartle bay forms a succession of table lands, varying in height from 200 to 1,500 feet, and rising in terraces one behind the other, the whole being clothed with long rich grass. The spurs from these table lands have an angular aspect, and extend parallel to each other, thus presenting great similarity. In the background a confused mass of high peaks may be observed, varying in height from 3,000 to 6,000 feet. Flat alluvial land extends from the coast to the foot of the table lands already mentioned.

Natives.—The villages, small and poor looking, are generally situated at the foot of one of the many mountain streams; the canoes appeared scarce and of small size. The natives were shy at first, but afterwards became friendly. Their language and huts are different from those of Bentley bay and East cape, the latter at this place being smaller and built close to the ground, instead of on poles.

GOODENOUGH BAY.—From cape Frere to the head of this bay the distance is about 37 miles in a north-westerly direction, and the coast keeps the same features throughout this distance. Five peculiar pinnacle-like peaks are situated about 25 miles westward of cape Frere, near the sea coast; grouped together, they stand well out, and appear prominent from the eastward.

At the head of Goodenough bay the coast suddenly trends E. by N. for a distance of about 23 miles, terminating in cape Vogel. With the alteration in the direction of the coast, the lofty grass land ceases, and the ridge of high mountains continues its north-westerly trend, leaving the coast range at this point, to hills of inferior altitude, and of different shape and formation. A large waterfall was seen near the head of Goodenough bay tumbling down the steep mountain's side to the westward. At the head of Goodenough bay the surface water was comparatively fresh and of a muddy green colour, but no large river was seen.

Natives of this bay appeared honest and friendly. Many villages are scattered over this part of the coast, on the sea side of the belt of alluvial land which extends along the foot of the mountains.

Mosquitoe Islands lie E.N.E. distant about $12\frac{1}{2}$ miles from the head of Goodenough bay. They are low, flat, of coral formation, and covered with trees, to which cream-coloured pigeons resort. Large black mosquitoes infest the woods. These islets fill up the entrance to Rawdon bay, in which are soundings of 20 fathoms, mud.

Good Anchorage was found to the southward of Mosquitoe islets, about half a mile from the shore, in 16 fathoms, stiff muddy bottom.

The Coast between Mosquitoe islets and the head of Goodenough bay is for the most part low, the hills being from 300 to 400 feet high, and thickly wooded. From Rawdon bay and Mosquitoe islets the coast trends

N.E. by E. for $9\frac{1}{2}$ miles to Glen islet, and continues low, the hills in the background being about 600 feet in height.

SOUNDINGS.—Between cape Frere and Goodenough bay the depth of water 2 miles off the coast was 620 fathoms, no off-lying dangers being observed.

Soundings of 42 fathoms were found at a mile from the shore, midway between Mosquitoe islets and head of Goodenough bay, the bottom consisting of stiff mud.

Glen Islet, small, with a few trees upon it, is situated on a plateau of coral reef, which joins it to the shore, and extends about a mile to the south-east.

Ship Islet, bearing N. by E. $2\frac{1}{2}$ miles from Glen islet, is similar in appearance to the latter, and at low water appeared to join the mainland. A reef of black-headed rocks was seen to extend from it for about half a mile to the south-east, thence to cape Vogel the coast line forms a bay, the shores of which are thickly wooded and low.

Snake Islet is situated close to the extremity of cape Vogel, and is small and insignificant; coral reef appeared to connect it with the cape at low water.

WARD HUNT STRAIT between cape Vogel (north-east coast of New Guinea) and the south-west shores of Goodenough island (D'Entrecasteaux group), is about 22 miles long by 15 miles broad.

A line of soundings from one or 2 miles off shore was taken on the New Guinea side of this strait, and the south-west shore of Goodenough island was partially explored; but whether the space included contains similar foul ground to Göschen strait, or whether it is sufficiently clear to afford a safe passage for ships by day or night, has not yet been ascertained.

Of the shores of Ward Hunt strait, that of Goodenough island to the northward is the bolder. Mount Goodenough is generally cloud-capped, but its steep sides loom darkly, and are visible at a great distance. The coast on the southern side of the strait is more undulating, lower, and of greater variety, the hills here not exceeding 600 or 700 feet in altitude, and the shores being generally low, with small sand and coral girt islets and bays.

Tide.—No set was experienced in this strait, and at springs the tides are probably much weaker than in Göschen strait; this would lead to the supposition that the waters are deep throughout, and not narrowed and confined like those of the latter strait by detached coral reefs and patches. The rise and fall near cape Vogel was estimated to be 6 feet.

CAPE VOGEL.—In making this cape it will be noticed that the hills which form the peninsula are low and flat. Seen from a distance to

the south-eastward, a bluntly conical hill situated to the northward of the Mosquitoe islets is first seen, making like an island, other elevations gradually show upon nearer approach, but it is not before a vessel is within 8 miles that the whole are observed to be continuous.

In rounding cape Vogel, no bottom was found at 50 fathoms at a mile from the shore.

The Coast from cape Vogel trends W. by N. to Carrington point which is steep, and then runs in a westerly direction, forming a bay about 7 miles long, in which is a point with a reef extending off, for one mile to the northward; it then bulges in a gradual round for about 12 miles to near the foot of a small dark hill, in the vicinity of which, the coast range, which has hitherto bordered the shore, ceases, and gives place to a thickly wooded plain, extending many miles back to the foot of distant mountains (probably Owen Stanley range), with here and there a small dark hill or elevation standing up from the surrounding level.

There are many small islets of similar appearance and of coral formation, and scattered discoloured patches of water, denoting shoals, lying off this part of the coast, and extending westward to Fir Tree point.

Anchorage was found among the eastern group of these islets, called Jabbering islets, in 22 fathoms, sandy bottom, but great caution should be used in approaching this position, as the surrounding reefs and islets rise nearly perpendicularly from great depths.

COLLINGWOOD BAY, about 25 miles across, by 20 miles deep, extends in a westerly direction to the north-westward of, and parallel to, Goodenough bay, forming the second large notch or indentation on the north-east coast of New Guinea westward of East cape.

The whole of the southern and western shores of Collingwood bay are low and flat, the plain which is thickly covered with trees extending 4 to 10 miles to the south, and a much greater distance to the westward.

The northern part of the bay is bold, rocky, and steep, mounts Victory and Trafalgar (about 4,000 feet high) rising in a massive lump, and having the aspect, when seen from a distance, of a large island. To this the name of cape Nelson has been given; it bears from cape Vogel N.W. by W. $\frac{1}{2}$ W., distant 59 miles.

Soundings of from 27 to 48 fathoms, mud, were found near the southern shores of the bay, in which there are numerous shoals and discoloured patches. On no account should the bay be navigated, until it is better known, except in the finest weather, and with a look-out from the masthead.

Fir Tree Point, on the southern side of Collingwood bay, 40 miles westward of cape Vogel, is low and sandy, with a small stream running into the sea close to it. Anchorage was found about half a mile to the

south-east of the point in 10 fathoms, mud, and a large supply of firewood was cut from the trees which grow close down to the beach.

All around this point is a plain, with trees of the same monotonous hue.

The natives were shy and distrustful, and communication was difficult.

Keppel Point is on the western side of Collingwood bay, near the commencement of the higher land. It is low, and has much foul ground extending off it. The extremity of this point bears (approximately) N.W. $\frac{1}{4}$ N. from Fir Tree point, distant 16 miles.

HARDY POINT bears N.N.E. $\frac{1}{4}$ E., distant about $12\frac{1}{2}$ miles from Keppel point, the coast between appearing bold and steep.

Hardy Islet bears S.S.E. $\frac{1}{4}$ E. distant 3 miles from Hardy point; it is low and covered with trees, but was not approached nearer than 2 miles.

The COAST from cape Nelson trends W. by S. and then W. by N. for about $4\frac{1}{2}$ miles to a point abreast Spear islets. The spurs of the hills descending from mount Trafalgar to this part of the coast have a gradual slope, and are covered with grass and scattered trees.

Collinson Point bears about S.W. by W. distant $2\frac{1}{2}$ miles from the western Spear islet; it appeared bold, but a coral reef with a small islet upon it extended eastward towards the Spear islets.

PORLOCK BAY extends in, in a southerly direction for about $4\frac{1}{2}$ miles, immediately westward of Collinson point; it is nearly 5 miles across at the mouth, but its real limits were not correctly ascertained. Villages were seen on its eastern shore, and a bluff-looking headland noticed in its south-western part.

Low Point is the western point of entrance to Porlock bay, and is low and wooded; it bears S.W. by W. $\frac{1}{4}$ W. from Collinson point, distant about 6 miles.

Immediately westward of Low point there are numerous small creeks flowing a short distance inland.

DYKE ACLAND BAY forms the third deep indentation on the north-east coast of New Guinea westward of East cape; it is approximately 37 miles across from Low point on the south to cape Sud Est on the north, and 12 miles deep. Its shores throughout are low and thickly wooded, being bordered by a plain which extends many miles into the interior, the trees with which it is covered appearing in the distance of the same uniform height and colour, and the whole coast presenting no marked features.

The western portion of the coast is bordered at the back of the plain already mentioned by a range of mountains, which, rising at 6 miles inland, extend in an irregular curve to the northward, varying in

height from 1,500 to about 2,000 feet. The southern limits of this range were not distinctly seen, the day being misty, and the clouds hanging low at the time of passing. No natives were met with in this bay, but the vessel's track was scarcely close enough to the shore to allow of their habitations being detected.

Soundings in Dyke Acland bay, where taken, were found to vary from 34 to 25 fathoms over a bottom of mud; these were at a distance of from 4 to 8 miles off shore, and no coral patches or discoloured water was sighted.

Cape Sud Est is the northern limit of Dyke Acland bay, and bears from Low point N.W. by W. $\frac{1}{2}$ W., distant 37 miles. The point is low and woody, and without any marked features.

CAPE KILLERTON, bearing N.W. 10 miles from cape Sud Est, is another low, wooded, projecting point, similar in all respects to cape Sud Est. About 5 miles W. by S. $\frac{1}{2}$ S. of it is a small eminence or rise 150 feet high, the trees upon which looked darker than those of the plain surrounding it.

Soundings, at 7 miles E. by S. $\frac{3}{4}$ S. of cape Sud Est were 30 fathoms, dark mud; 5 miles N.E. of the same point 25 fathoms, sand and mud; and continuing the line parallel to the shore, at 5 miles N.N.W. of cape Killerton, 19 fathoms, muddy bottom, was found.

A small sand-bank, drying about 4 feet, was seen $3\frac{1}{2}$ miles N.W. by W. $\frac{1}{2}$ W. of cape Killerton, showing very white when the sun shone upon it.

HOLNICOTE BAY.—From cape Killerton, and between it and Caution point, the coast forms a slight bay, to which the above name was given; its shores are low, and the same description of plain extends for many miles back into the interior.

The soundings in this bay at a distance of about 3 miles from the shore, were found to be 24 and 26 fathoms, over a muddy bottom.

Caution Point, about 27 miles N.W. by N. of cape Killerton, is bold, and terminates to the southward in a bluff of moderate height.*

About 2 miles south-westward of the bluff just mentioned, and abreast a small lagoon, soundings were struck in 5 fathoms, over a sandy bottom.

Anchorage was obtained about three-quarters of a mile south-eastward of Caution point in 15 fathoms, sand.

Natives were communicated with, but not without difficulty, and they appeared inclined to be treacherous. These people seemed darker

* D'Entrecasteaux, in his voyage along this coast, mistook this bluff in the distance for the south part of an island, and he gave to this part the name of Riche island, after one of the naturalists attached to his expedition.

than those of the villages to the south-eastward on this coast, and were the first seen that were in a completely nude state.

CAPE HUNT is bold and well defined, bearing N. by W. $\frac{1}{2}$ W. about 9 miles from Caution point; the land over it is approximately 400 feet high and well wooded. Between it and Caution point are five rocky heads or points dividing small bays, which were not closely examined. Southward of one of these heads called Red Rocky point, bearing South $3\frac{1}{2}$ miles from cape Hunt, soundings of 10 and 11 fathoms were found over a muddy bottom.

Mitre Rock, 40 feet high and shaped like a bishop's mitre, stands in an isolated position about two-thirds of a mile north-eastward of cape Hunt. It appeared to be composed of a grey stone resembling decomposed granite, and is probably steep-to. Soundings of 44 fathoms, sand, were found half a mile E. by S. of the rock.

Ambush Point bears W. by N. distant $5\frac{1}{4}$ miles from cape Hunt, the coast between being steep-to, and with but slight indentations; the point is low and flat, and near it commences the plain, which, surrounding cape Hunt and the land in the immediate vicinity on its northern, western, and southern sides, gives to it when seen from a distance the appearance of an island.

Traitors Bay.—Upon each side of Ambush point a small river flows into the sea, and immediately to the westward is Traitors bay, extending in a southerly direction for about 2 miles.

Wood suitable for steaming purposes was easily obtained at Ambush point, the vessel anchoring in 15 fathoms, sandy bottom, about half a mile westward of the point, and a cable from the shore.

The natives here were hostile, and like their neighbours of Caution point quite naked. Resistance was offered by them to a wooding party, but a rifle shot proved sufficient to scatter them.

War Song Point is the western point of entrance to Traitors bay, and bears from Ambush point W. by N. $\frac{3}{4}$ N., distant about 5 miles; it is low and wooded.

Alligator Point bears N.W. by W. $\frac{1}{2}$ W. distant about 6 miles from War Song point; the coast between is low and wooded, and curves in the shape of a crescent, forming a slight bay. Alligators were seen in the vicinity of this point, and also near War Song point.

Soundings of 11 fathoms, muddy bottom, were found at three-quarters of a mile from the shore in the bay between War Song and Alligator points; and at half a mile northward of Alligator point the depth was 25 fathoms, mud, increasing at a distance of $2\frac{1}{2}$ miles to 40 fathoms, sand.

HERCULES BAY, between Alligator point and a point north-westward of it, is probably 14 miles wide, by 5 miles deep; its southern shores are low and woody, but the western are hilly, being backed by Broken range, which is about 400 feet high.

Andrew Islands are near the centre of Hercules bay, about a mile from the shore; they lie N.W. by N. and S.E. by S. of each other, about $1\frac{1}{2}$ miles apart; both are low and wooded, the northern being 70 feet, and the southern 40 feet above the level of the sea.

Soundings of about 28 fathoms prevail over the south part of the bay at a distance of about 3 miles from the shore; but near the western side, depths of 6, 7, and 8 fathoms were found, at $1\frac{1}{2}$ miles from the shore.

Luard Islets are six in number, lying off the extremity of a cape, the group taking a shape something like the letter T. They vary in height from 40 to 70 feet, and all are covered with trees. From the outer or easternmost islet, the north point of Hercules bay bears S. by E., distant 3 miles. To the south-east about 2 miles from the north point of Hercules bay, a rivulet empties itself into the sea; and between this point and Luard islets are two bays, divided by a bluff rocky point, on the face of which a bright spot showed prominently when the sun shone upon it.

Hosken Island, estimated at 150 feet high, small and wooded, bears from the outer Luard islet N.W. by W., distant $7\frac{1}{2}$ miles. It is situated about half a mile off shore, abreast a well-rounded bluff point.

The coast between this point and Luard islets appears steep, high, and even, without any remarkable indentation.

Layard Islets are two in number, small and low, bearing N.N.E. and S.S.W. of each other, about three-quarters of a mile apart; the western one being a mile from the shore. To the westward of them is a right about 2 miles deep, with a detached rock 12 feet high off its north-western entrance point.

Bee and Wasp Islets are small, low, and wooded, N.W. and S.E. of each other apparently a mile apart.

Bee islet lies about 5 miles N.W. by W. $\frac{1}{2}$ W. of the northern Layard islet.

Deaf Adder Bay, so called from the fact of one of these reptiles being here found, is about 5 miles north-westward of Wasp islet, and extends in a south-westerly direction for about $1\frac{1}{2}$ miles; the head of the bay appeared shoal, but indifferent anchorage was obtained in 35 fathoms near its eastern point, which is low, sandy, and wooded. The remainder of the bay is rocky and steep, and a range of hills extending along

ts western side attain an altitude to the southward perhaps of 1,000 feet or more. A few deserted huts were seen here, but no village or natives. North-eastward of the eastern point of this bay are the Straggling islets, small, rocky, wooded, and similar in appearance, lying N.W. by W. and S.E. by E. of each other, about $2\frac{1}{4}$ miles off shore. Between these islets and Deaf Adder bay are soundings of 50 fathoms, mud, and along the coast between these islets and the Luard islets, at a distance of about 2 miles off shore, are soundings of 55 fathoms over a muddy bottom.

HUON GULF, formed between cape Longuerue and cape Cretin, is estimated to be 55 miles wide and 41 miles deep in a north-west direction. Wherever soundings were tried for in skirting the shores of this gulf the depths found were great, and its shores seemed quite clear of coral reefs and isolated dangers, such as the mushroom coral patches found on the southern part of the coast. The ranges of mountains surrounding the gulf were generally of a height of about 2,000 feet above the sea level. At the head of the gulf, and for nearly 2 miles inland, the country is low, and near Parsee point on the western side the coast range is broken into by a deep valley; southward of this, bold stony wooded ranges border the coast, descending steeply to the water's edge.

The configuration of the land at the head of Huon gulf might lead to the expectation that a large river would empty itself in the vicinity, but such is not the case, the rivers and river beds being small, with barred entrances, and scarcely deserving the title of river. No villages were seen in the south-west part of the gulf; northward of Parsee point, however, they again became numerous. Many of the natives of this locality wear a peculiar head dress of tappa, shaped like a Parsee hat, hence the name of Parsee point.

Tides.—The rise and fall appeared in April and May to be very small at the positions where the *Basilisk* anchored in this gulf, and the tidal streams are probably very weak.

Islets off Deaf Adder bay and south-eastward of Saddle island consist of Fly islets (two in number), Steep islets (ten), and one or two small islets unnamed; for the position of all of which the reader is referred to the Admiralty Chart.

Longuerue Islands are spread over the south-west part of Huon gulf. With the exception of Saddle island these islets are small, wooded, and rocky, free of coral reef, and very similar in appearance.

Saddle Island is the largest of the Longuerue islands, being about $2\frac{1}{4}$ miles long East and West, by a mile in breadth; it has a saddle-shaped summit, the peaks of which lie East and West of each other, near the centre

of the island, and attain a height of about 700 feet. Off the south-west and south-east points of the island, coral reef extends for about one quarter of a mile, and two small rocky islets are situated off the north-west end within 2 miles of the shore of the island. No inhabitant nor cultivation was seen on this island, but it was observed to be thickly wooded throughout.

Dumpling Islets are three in number, lying N. $\frac{1}{2}$ E. and S. $\frac{1}{2}$ W. of each other, about a mile apart. The northern islet bears from the northern summit of Saddle island N.N.W., distant $5\frac{1}{2}$ miles. All are thickly wooded, and their estimated heights were 180, 200, and 250 feet, the highest being the northern, and the lowest the southern islet.

The COAST of New Guinea inside Saddle island, and southward to Deaf Adder bay, appeared bold, rocky, and deeply indented. The shores generally are thickly clothed in wood, and there was a noticeable absence of cocoa-nut groves and villages.

On the coast range abreast Saddle island, and bearing from it S.W. about 5 miles, is a prominent conical hill approximately 1,200 feet high.

The coast inside Dumpling islets, about 3 miles distant from them, retains its bold and rocky character; the range of mountains seen from seaward bordering the shore averaging 2,000 feet in height.

Soundings inside the Longuerue islets, from Deaf Adder bay northward, were regular at about 58 fathoms, muddy bottom; the line of soundings taken leads about a mile off shore, decreasing near the prominent points, and the depths continue much the same to a point bearing S.S.W. $\frac{3}{4}$ W., distant 3 miles from Solitary islet.

Kuper Range of mountains here overlooks the coast. The summits were clouded at the time of passing, but towards the southern part of the range were estimated to reach an altitude of 2,000 feet.

The COAST northward of Solitary islet, for about 10 miles to Dot islet, was obscured by a thick haze at the time of the *Basilisk's* passage, where the nature of the coast changes, and is broken up into plains and valleys.

Solitary Islet, 200 feet high, bears N.W. by N. (approximately) $7\frac{1}{4}$ miles from the North Dumpling; it is rocky and conical in shape, having its summit thickly covered with trees.

No bottom with 200 fathoms of line could be found about 5 miles north-eastward of it.

Dot Islet, lying off a point of land, to the southward of which is a bay with cultivated ground at its head, bears N.N.W. $\frac{3}{4}$ W. distant about 9 miles from Solitary islet, and is small, wooded, and 100 feet high.

PARSEE POINT is about 6 miles to the northward of Dot islet, and projects in the form of a high and prominent peninsula, connected to the mainland on its western side by low well-timbered land.*

South-eastward of Parsee point, and between it and Dot islet, is Rawlins point, which is bold, and apparently steep-to.

Between Rawlins and Parsee points is a bay, at the head of which a plain extends several miles back. Villages were seen in this bay, and on the south side of the Parsee peninsula.

Shallow Bight, taking its name from its appearance, extends in a south-westerly direction to the northward of Parsee point; it was not examined, but a village was noticed upon the beach at its head.

To the northward of Shallow bight the coast trends N.N.W. and continues bold and rocky for about 6 miles, then occur two breaks formed by sand beaches, with a rounded steep bluff between.

Anchorage was found in 21 fathoms, mud, about 12 miles N.W. $\frac{3}{4}$ N. of Parsee point, at half a mile from the beach, the soundings gradually decreasing from 45 fathoms to 35 and 21 fathoms, muddy bottom.

Some natives were seen in this neighbourhood, but were not communicated with.

From the position of the anchorage just given, the coast at the head of Huon gulf forms a curve. A small river winding through the plain (which runs westward at this place nearly 15 miles) finds its way into the sea about 16 miles N.N.W. $\frac{1}{2}$ W. of Parsee point, discolouring the surface of the water for some distance from the land. The mouth of this river is barred, and boats cannot enter.

At 5 miles N.E. $\frac{1}{2}$ E. of this river, is the dry bed of another large mountain torrent, which, during the rainy season must discharge a considerable volume of water into the sea; at less than a mile southward of it, no bottom could be found with 100 fathoms of line. Further eastward about 7 miles, a small point protrudes, and at $1\frac{1}{4}$ miles eastward of it is a considerable stream of fresh water, which pours through a valley in the Rawlinson range of mountains.

The COAST then trends East and E. by N. for about 33 miles to False islet, and is without any very marked features, being in some parts rocky, in others low and sandy. The Rawlinson range here runs parallel to the coast line at 3 miles inland, some of its summits reaching an altitude of 2,000 feet.

A small shoal patch, having but a few feet of water upon it, was seen about $1\frac{1}{4}$ miles southward of a small village and grove of cocoa-nut trees,

* In the offing this peninsula shows like an island, and in consequence it was so marked upon the original chart of the French, made by D'Entrecasteaux.

in latitude $6^{\circ} 44' 30''$ S., and longitude $147^{\circ} 24'$ East (approx.) At half a mile on the west side of this danger, there was no bottom with 100 fathoms of line.

Anchorage was found at 6 miles E. by N. $\frac{1}{4}$ N. of this shoal spot in 27 fathoms, mud and sand, about half a cable from the beach, but it was of an indifferent nature, the bottom being very steep.

Soundings.—At distances varying from a half to 2 miles along this part of the coast between False islet and the head of Huon gulf no soundings could be found with 100 fathoms of line, and the danger already spoken of was the only detached one seen from the masthead of the ship, in fine clear weather.

False Islet is small and low, and appeared to be nearly joined to the shore.

Cretin Islands were not approached nearer than 4 miles, the ship passing between them and the mainland, and failing to find soundings with 100 fathoms of line. There appeared to be four islets, all small, low and well wooded, the western two being close together. Cocoa-nut trees and villages were seen upon them, and many canoes put off under sail to communicate with the ship as she passed. The approximate position of this group is 6 miles E.S.E. of False islet, in latitude $6^{\circ} 43' 30''$ S., and longitude $147^{\circ} 53'$ E.

CAPE CRETIN, the north-east extremity of Huon gulf, is a bold headland of rounded shape, having three small islets off it close to the shore; the hills at the back of the cape are probably 600 feet high, with grassy slopes, well wooded in parts, the whole having a very picturesque effect. After passing cape Cretin the coast takes a trend at right angles, in a northerly direction.

At $4\frac{1}{2}$ miles N. by W. of cape Cretin is a bay, with a village and a stream, beyond which is a well-marked bluff, and northward of that again, another small bay and village. To the north of the bluff just mentioned, at a distance of about $9\frac{1}{2}$ miles, are two rocky points, with a beach and village between; the coast then commences to trend to the westward, and a bay with a beach at its head forms the southern side of Fortification point.

FORTIFICATION POINT, so called from the exposed strata of rock upon its face running in parallel lines so as to appear like fortifications, rises steeply from the sea, and is bare and barren looking; its approximate position is in latitude $6^{\circ} 20'$ S., longitude $147^{\circ} 48'$ East, and it may be considered the south-eastern limit of the Finisterre range of mountains, although the land to the southward of it continues high, gradually decreasing in altitude towards cape Cretin.

SOUNDINGS.—No soundings with 60 fathoms of line could be found 3 miles S.E. by E. of Fortification point, and the water had all the appearance of being very deep close up to the coast. At 9 miles N.N.W. of Fortification point, a sounding gave 420 fathoms, over a bottom of brown sand and mud.

CAPE KING WILLIAM is difficult to define, the coast rounding gradually and preserving its steepness. The part taken for cape King William is a slightly projecting point, about 20 miles N.W. by N. of Fortification point, with a village close to the northward of it.

The **COAST** between cape King William and Fortification point appeared bold and steep, and curved slightly, forming a bay

MOUNT CROMWELL rises from the eastern part of the Finisterre range to a height of 7,700 feet ; it is situated nearly 8 miles inland from cape King William, and takes the shape of a blunt cone, apparently covered with tropical forest.

Winds and Weather.—Eastward of cape King William, with the exception of an easterly squall off Fir Tree point, and a fresh easterly breeze off cape Cretin, the weather during the months of April and May was calm and sultry, with occasional light and variable winds.

Tides.—The rise and fall appeared small, and the tides feeble during April and May, and scarcely any current was found close in-shore on this part of the coast.

T I D E S.

TIDE TABLE for the EAST COAST of AUSTRALIA, TORRES STRAIT,
NEW GUINEA, and the CORAL SEA.

PLACE.	High Water, Full and Change.	Rise.		PLACE.	High Water, Full and Change.	Rise.	
		Springs.	Neaps.			Springs.	Neaps.
<i>East coast.</i>							
Port Jackson, Garden island.	8 30	5	4	Flinders group - - -	9 15	8-12	—
" between Sydney heads.	8 15	6	—	Cape Sidmouth - - -	9 15	10	—
Broken bay - - -	8 30	5	7	Cape Grenville - - -	9 15	10	—
Newcastle harbour - - -	9 0	3½-5	—	Sir Charles Hardy islands -	9 15	10	—
Port Stephens, Nelson bay	8 30	4-8	—	Port Albany - - -	0 15	10	7
Manning river - - -	9 15	5	3	Evans bay - - -	11 15	10	4
Port Macquarie bar - - -	9 15	5	3	<i>Torres strait.</i>			
MacLeay river - - -	9 15	5	3	Blackwood bay, Mount	11 15	11	—
Solitary islands - - -	9 15	5	3	Adolphus island.	1 0	9½	—
Clarence river, South head	8 30	4	—	Possession island - - -	Irreg.	7	—
Richmond river bar - - -	9 20	—	—	Wallis islands - - -	Irreg.	11½	4½
Cape Byron bay - - -	9 45	6	—	Normanby sound - - -	4 30	8	—
Danger point - - -	9 30	6	4½	Booby island - - -	—	9-12	—
Moreton bay, Toorbul point	9 45	6-8	—	Prince of Wales channel -	Noon	10-14	—
" Comboyuro point.	9 30	4-7	—	Phillip harbour, Jervis island.	—	—	—
" Pumice stone strait.	9 45	6-8	—	Murray islands - - -	9 30	10	—
" Islands at head of.	11 0	6	—	Bramble cay - - -	9 15	12	—
Brisbane - - -	11 0	6½	—	Darnley island - - -	9 30	12	—
" The Quarry - - -	10 30	9½	—	Turtle-backed island -	0 15	10	—
" At the Bar - - -	10 5	7	5½	Great North-east channel, north-east entrance.	9 20	10-12	—
Wide bay, Hook point - - -	8 30	6	—	Great North-east channel, south-west end.	0 15	10	—
Mary river heads - - -	9 30	8-10	—	<i>East coast—Great Barrier reef.</i>			
" Maryborough - - -	Noon	—	—	Swain reefs - - -	8 30	7	—
Great Sandy strait, northern entrance.	9 14	10	7	Trinity opening - - -	9 15	7-12	—
Sandy cape - - -	8 50	6-8	—	Raine island - - -	8 10	10	—
Hervey bay, head of - - -	9 14	10	—	<i>New Guinea.</i>			
Burnett river - - -	9 30	8-9	3-4	Tauan, or Mount Cornwallis island.	11 30	12	—
Port Curtis - - -	9 30	10-12	—	Port Moresby - - -	8 30	6	—
Keppel bay - - -	9 0	11	7	Possession bay, Hayter island.	8 0	5	2½
Lady Elliot island - - -	9 0	7-8	—	Fortescue strait - - -	8 0	4 5	—
Capricorn group, Heron islet.	9 0	10	—	Göschén strait - - -	8 0	5	—
Port Bowen - - -	10 25	11-15	12	<i>Islands and Reefs off the East coast, and in the Coral sea.</i>			
Shoal Water bay - - -	11 30	19-22	13	Lord Howe island - - -	8 30	6	—
Broad sound, St. Lawrence creek.	11 50	20	—	Elizabeth reef - - -	8 30	8	5
Thirsty sound, south-west entrance.	11 50	30	—	Middleton reef - - -	8 30	6	—
H. H. (Guard fish) cluster	11 20	14-18	—	Cato island - - -	8 0	6	—
Perey isles, No. 2 isle - - -	10 30	16	13	Bird islet, Wreck reef -	8 3	6	—
Pioneer river, at the bar -	11 7	10½-10	—	Kenn reef - - -	8 0	5½	—
Repulse isles, Repulse bay	11 0	18	—	Frederick reef - - -	8 0	6	—
Thomas island, Cumberland islands.	11 5	21	—	Saumarez reef - - -	8 0	6	—
L. island, Cumberland islands.	—	24	—	Middle Bellona reef - - -	8 30	6	—
Port Denison - - -	9 30	6	—	Long island, Chesterfield reef.	8 30	5	—
Cape Upstart - - -	9 0	6	—	Avon isles - - -	9 30	5	2½
Cleveland bay - - -	9 30	5-10	—	Renard island, Bampton reef.	8 20	5	—
Rockingham channel - - -	9 30	6-12	—	Mollish cay - - -	7 55	5½	—
Dunk island - - -	9 28	6 10	—	Lihou reef - - -	8 0	6	—
Mourilyan harbour - - -	—	8-13	—	Willis islets - - -	8 0	6	—
Fitzroy island - - -	9 15	7-12	—	Osprey reef - - -	8 36	6	—
Cairns (Trinity harbour) -	9 30	8-10	—				
Port Douglas - - -	9 0	9-12	2-4				
Daintree river - - -	—	6-9	—				
Endeavour river, at the bar	8 0	5-10	—				
" Cooktown - - -	9 15	7-9	5				
Lizard island - - -	9 15	7-10	—				

TABLE OF POSITIONS *

ON THE

EAST COAST OF AUSTRALIA, TORRES STRAIT, AND CORAL SEA.

Place.	Particular spot.	Latitude, South.	Longitude, East.
EAST COAST.			
Port Jackson -	Fort Macquarie -	33 51 42	151 14 0
" -	Outer South head Lighthouse -	33 51 30	151 18 15
Long point and reef -	Extreme of the reef -	33 45 40	151 21 30
Broken bay -	Baranjo head -	33 35 0	151 30 30
Cape Three points -	Second point -	33 30 0	151 27 30
Norah head -	Extreme -	33 16 40	151 36 15
Newcastle harbour -	Nobby head Lighthouse -	32 55 15	151 49 15
Port Stephens -	Tahlee house -	32 40 10	152 1 15
" -	Stephens point Lighthouse -	32 45 10	152 13 20
Sugar-loaf point -	Lighthouse -	32 26 10	152 33 20
Seal rocks -	North-easternmost -	32 27 30	152 34 30
Harrington inlet -	Entrance -	31 53 15	152 42 30
Mermaid reef -	Centre -	31 46 40	152 49 30
Port Macquarie -	Entrance -	31 25 30	152 56 15
Solitary isles -	South isle Lighthouse -	30 12 0	153 17 0
" -	North isle -	29 55 15	153 24 30
Clarence river -	South head Lighthouse -	29 25 30	153 23 10
Richmond river -	North head Lighthouse -	28 51 30	153 35 45
Cape Byron -	Extreme -	28 37 30	153 39 30
Mount Warning -	Summit -	28 23 10	153 17 30
Danger point and Tweed river.	The point -	28 9 30	153 34 30
Look-out point -	Extreme -	27 26 30	153 33 50
Cape Moreton -	Lighthouse -	27 2 10	153 29 0
Double Island point -	East extreme -	25 55 50	153 13 50
Wide bay -	Outer edge of the bar -	25 47 0	153 13 50
Indian head -	Extreme -	25 0 15	153 23 0
Sandy cape -	North-east extreme -	24 41 20	153 17 0
Breaksea spit -	North extreme -	24 24 30	153 18 0

* The longitudes of these positions have been adapted to the meridian of Fort Macquarie, Sydney, assumed in 151° 14' East from Greenwich.

The important meridian of Fort Macquarie appears to be yet open to investigation. The late Admiral P. P. King, from numerous observations, considered it to be in 151° 15' 25"; the late Captains F. P. Blackwood O. Stantley, and Lieutenant Yule, for their surveys of the East coast, Torres strait, and New Guinea, adopted 151° 14' 30", as reduced from the longitude of Paramatta observatory, then considered in 151° 1', and Captain H. M. Denham, for his operations in the Pacific ocean, in 1864, employed 151° 14' 40". Captain J. L. Stokes, for the New Zealand surveys, adopted 151° 15' 30". An analysis of documents in the Hydrographic Office, embracing observations made between the years 1788 and 1861, by numerous navigators and astronomers, places Fort Macquarie in 151° 15' 5" East.

The longitude of Fort Macquarie (deduced from the longitude of Sydney observatory, in 151° 11' 49" 5, as adopted by Mr. Russel, the Government astronomer of New South Wales, and given in the Nautical Almanack for 1879) is 151° 15' 25" 5 East.

Fort Macquarie being considered 2° 26 or 34' East of Sydney observatory. The longitude of Fort Macquarie (by electric telegraph from Melbourne observatory (144° 58' 53") is 151° 15' 23" East.

Garden island, sometimes used as the place of observation, lies 0° 0' 47" East of Fort Macquarie.

Place.	Particular spot.	Latitude, South.	Longitude, East.
EAST COAST—cont.			
Burnett river -	South head -	24 45 0	152 25 20
Bustard head -	Lighthouse -	24 1 20	151 42 0
Rodd bay -	Spit end -	24 1 20	151 37 15
Port Curtis -	Gatcombe head -	23 52 50	151 23 40
Cape Capricorn -	Lighthouse -	23 29 30	151 15 0
Cape Manifold -	Islet -	22 41 0	150 51 45
Lady Elliot islet -	Centre -	24 7 0	152 45 30
Bunker group -	No. 1, South-easternmost islet -	23 54 20	152 24 30
" -	No. 3, North-westernmost islet -	23 48 30	152 18 20
Capricorn group -	One-tree islet -	23 30 30	152 7 45
" -	North reef Lighthouse -	23 10 50	151 56 10
" -	Rocky patch -	23 3 30	151 51 0
Port Bowen -	Observation rock -	22 31 40	150 46 40
Cape Townshend -	North extreme -	22 12 10	150 29 30
Pier head -	Summit -	22 6 30	150 2 20
Cape Palmerston -	North extreme -	21 32 0	149 32 0
Northumberland isles -	1st South-easternmost peak -	21 57 30	150 42 0
" -	h.—Peak -	21 39 0	149 49 50
" -	Prudhoe isle—summit -	21 19 15	149 43 30
Percy isles -	No. —Summit -	21 46 0	150 21 0
" -	Pine peak -	21 31 30	150 18 45
Cape Conway -	South-east point -	20 32 20	148 58 0
Port Molle -	South side of entrance -	20 18 50	148 53 15
Mount Dryander -	Summit -	20 14 0	148 34 30
Gloucester island -	Summit near North end -	19 57 30	148 28 30
Port Denison -	Observatory point, west side of Stone isle. -	20 0 50	148 17 50
Cumberland isles -	k l—South-easternmost -	21 5 30	149 58 30
" -	l l.—Peak -	20 55 30	149 29 30
" -	Whitsunday island, summit on the west side. -	20 15 30	149 0 0
" -	Hook isle, hill at the northern end. -	20 4 30	148 58 30
Holborne isle -	Centre -	19 41 50	148 23 0
Cape Bowling-green -	Lighthouse -	19 19 20	147 27 40
Cape Cleveland -	North-west extreme -	19 11 15	147 1 10
Palm isles -	South-east point of the south-east, or largest island. -	18 45 30	146 42 50
Cape Sandwich -	Extreme -	18 13 30	146 20 0
Rockingham bay -	Goold isle, peak -	18 9 30	146 12 0
Kennedy shoal -	Centre -	18 4 30	146 28 30
Dunk island -	South-east summit -	17 57 0	146 12 0
Barnard isles -	Outer Northern isle -	17 40 30	146 12 30
Frankland isles -	High isle -	17 9 45	146 2 30
Fitzroy isle -	Summit -	16 55 45	146 1 30
Snapper isle -	South-east extreme -	16 18 0	145 32 0
Cape Tribulation -	Extreme -	16 4 20	145 30 30
Hope isles -	South islet -	15 45 0	145 28 30
Mount Cook -	Summit -	15 29 45	145 17 30
Cape Bedford -	South-east extreme -	15 16 30	145 23 15
Look-out point -	North-east extreme -	14 49 45	145 15 45
Lizard island -	Summit -	14 40 0	145 30 0
Murdoch point -	Extreme -	14 37 15	144 57 30
Barrow point -	East extreme -	14 22 30	144 42 0
Cape Melville -	North-eastern extreme -	14 10 0	144 33 30
Flinders group -	Cape Flinders, north extreme of north island. -	14 7 45	144 16 15

Place.	Particular spot.	Latitude, South.	Longitude, East.
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EAST COAST—cont.

		° ' "	° ' "
Claremont point	- Extreme - - -	14 0 30	143 42 15
Claremont isles	- No. III.—Centre - -	13 46 15	143 40 0
Cape Sidmouth	- Extreme - - -	13 24 45	143 37 15
Dugdale rock	- Centre - - -	13 1 45	143 36 15
Cape Direction	- North-east extreme - -	12 51 0	143 34 0
Cape Weymouth	- Restoration isle - -	12 37 15	143 27 30
Fair Cape	- Extreme - - -	12 24 15	143 16 30
Cape Grenville	- Extreme - - -	11 58 15	143 15 15
Sir Charles Hardy isles	- South-eastern isle, north extreme.	11 55 0	143 29 0
Cockburn reef	- Northern Cockburn islet	11 50 30	143 19 15
Middle banks	- Westernmost bank - -	11 47 0	143 37 45
Bird isles	- North-western isle - -	11 46 30	143 6 0
Hannibal isles	- Eastern islet - - -	11 36 30	142 57 15
Boydong cays	- Westernmost islet - -	11 29 40	143 2 0
Cairncross isle	- Centre - - -	11 14 30	142 55 45
Tern islet	- Centre - - -	11 0 0	142 46 0
Brothers	- South Brother - - -	10 43 0	142 41 30
Mount Adolphus	- Summit - - -	10 37 45	142 39 20
Cape York	- Sextant rock - - -	10 41 30	142 33 20

TORRES STRAIT.—WESTERN CHANNELS.

a. rock	- Centre - - -	10 36 40	142 31 20
Peaked hill	- Summit - - -	10 42 45	142 26 30
Endeavour strait	- Cape Cornwall, extreme	10 46 0	142 10 50
"	- Red Wallis isle, centre	10 50 40	142 1 40
Tuesday islet	- North-eastern islet - -	10 32 30	142 21 30
Wednesday island	- Ince point - - -	10 30 0	142 19 0
Larpet bank	- West extreme - - -	10 35 15	141 59 30
Booby island	- Centre - - -	10 36 5	141 54 45
Double island	- Summit of eastern island	10 27 40	142 27 0
White rocks	- Centre - - -	10 28 0	142 2 45
Travers isles	- Centre - - -	10 22 0	142 22 15
Long reef	- East extreme - - -	10 17 30	142 19 30
Duncan isles	- Whale isle, north summit	10 15 30	142 4 40
Mount Ernest	- Peak - - -	10 15 20	142 29 15
South Bank	- West extreme - - -	10 9 30	141 57 15
Watson cay	- Centre - - -	10 2 30	142 27 30
Possession isle	- Centre - - -	10 5 0	142 20 0
Jervis island	- Peak - - -	9 58 0	142 11 0

TORRES STRAIT.—PAPUAN, OR GREAT NORTH-EAST CHANNEL.

Bramble cay	- Centre - - -	9 7 50	143 52 10
Bampton island	- South-east extreme of reef extending from the island.	9 6 0	143 26 0
Stephens isle	- Centre - - -	9 30 45	143 33 0
Darnley island	- Peak - - -	9 35 15	143 45 0
Warrior reef	- Centre of eastern edge - -	9 33 0	143 13 0
Dungeness reef	- Centre of eastern edge - -	9 56 30	143 1 0
Cocoa-nut isle	- Centre - - -	10 3 15	143 4 30
The Three Sisters	- Bet islet - - -	10 9 0	142 49 15
Ninepin rock	- Centre - - -	10 14 0	142 41 0
Mount Cornwallis	- Summit - - -	9 25 30	142 32 30

TABLE OF POSITIONS.

593

Place.	Particular spot.	Latitude, South.	Longitude, East.
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EAST COAST.—OUT-LYING ISLANDS AND REEFS.

			°	'	"	°	'	"
Lord Howe island	-	Mount Gower	-	-	-	31	36	30
Ball Pyramid	-	Summit	-	-	-	31	45	10
Elizabeth reef	-	Centre	-	-	-	29	56	0
Middleton reef	-	West elbow	-	-	-	29	27	40
Doubtful Dangers	-	Middleton island	-	-	-	28	18	0
"	"	Favorite reef	-	-	-	26	5	0
"	"	Capel bank	-	-	-	25	15	0
"	"	A rock	-	-	-	24	0	0
"	"	An islet	-	-	-	26	10	0
"	"	An island	-	-	-	23	40	0
"	"	A reef	-	-	-	23	40	0

EAST COAST.—GREAT BARRIER REEFS.

Swain reefs	-	Southern extremity	-	-	22	23	10	152	36	50
"	-	North-east extreme	-	-	21	5	0	152	52	0
Flinders passage	-	Northern entrance	-	-	18	52	0	148	4	0
Slasher reef	-	Centre of outer edge	-	-	18	32	0	147	7	0
Trinity opening	-	Centre	-	-	16	30	0	146	0	0
Endeavour opening	-	Centre	-	-	15	42	0	145	49	30
One-and-half mile opening.	-	Centre	-	-	14	26	0	145	28	30
No. 1 Sand-bank opening	-	Sand-bank on east side	-	-	14	11	0	144	54	15
No. 2 Sand-bank opening	-	Sand-bank on east side	-	-	13	59	0	144	32	45
No. 3 Sand-bank opening	-	Sand-bank on east side	-	-	13	58	30	144	29	0
No. 5 Sand-bank opening	-	Sand-bank on east side	-	-	13	43	0	144	14	45
First 3-mile opening	-	Sand-bank on the north-west side.	-	-	13	26	30	144	1	0
Second 3-mile opening	-	Small coral patch in the centre	-	-	13	5	0	143	35	0
Southern Small detached reef.	-	Centre	-	-	12	35	30	143	51	30
Northern Small detached reef.	-	Centre	-	-	12	24	30	143	50	0
Quoin entrance	-	Centre	-	-	12	23	40	145	45	30
Wreck bay	-	Black rocks	-	-	12	12	30	143	56	0
"	-	North point of entrance	-	-	12	6	45	143	58	0
Single Rock entrance	-	Centre	-	-	12	1	30	143	56	30
Yule detached reef	-	Centre	-	-	11	58	0	143	59	0
Stead passage	-	Centre	-	-	11	55	0	143	50	0
Great detached reef	-	Outer extreme	-	-	11	44	30	144	7	0
Raine island	-	Beacon	-	-	11	35	50	144	2	20
Pandora entrance	-	Sand-bank on the south-east side.	-	-	11	26	30	144	1	30
Olinda entrance	-	Centre	-	-	11	14	30	144	6	0
Yule entrance	-	South side of the entrance patch.	-	-	10	23	0	143	56	30
Fly entrance	-	Centre	-	-	10	1	0	144	4	0
Cumberland passage	-	Centre	-	-	9	52	30	144	9	0
Murray isles	-	Summit of Maér isle	-	-	9	55	0	144	2	0
Flinders entrance	-	Sand-bank on the north-west side.	-	-	9	35	0	144	11	0
East cay	-	Centre	-	-	9	23	45	144	12	0
Anchor cay	-	Centre	-	-	9	22	0	144	6	0

TABLE OF POSITIONS.

Place.	Particular spot.	Latitude, South.	Longitude, East.
CORAL SEA.			
		° ' "	° ' "
Ferrier bank -	Centre -	23 28 0	155 32 0
Cato island -	Centre -	23 15 0	155 34 0
Australia rock -	Centre -	22 45 0	156 6 0
Wreck reef -	Bird islet -	22 10 30	155 29 30
" -	West islet -	22 12 0	155 11 50
Kenn reef -	Central and largest cay -	21 15 40	155 49 30
" -	North-west extreme -	21 6 10	155 47 0
Frederick reef -	Observatory cay, southern reef -	21 1 45	154 25 10
Carns Mid-day reef -	Centre -	21 58 0	154 30 0
Welsh reef -	Centre -	21 15 0	153 56 0
Saumarez reefs -	S.W. cay -	21 50 50	153 31 0
" -	N.E. cay -	21 38 10	153 47 30
South Bellona reefs -	West point of western reef -	21 52 20	159 26 10
" -	Sand cay -	21 47 20	159 35 0
Middle Bellona reefs -	Observatory cay, western reef -	21 24 30	158 52 50
Booby reef -	North-west extreme -	20 57 0	158 31 50
N.W. Bellona reef -	North-west point -	20 47 40	158 28 10
Chesterfield reefs -	South elbow -	19 59 0	158 30 0
" -	Long island, north-west extreme -	19 52 20	158 20 0
" -	North-west point -	19 37 20	158 13 30
Avon islets -	Southern islet -	19 32 0	158 15 30
Bampton reef -	North elbow -	19 1 20	158 27 0
" -	Renard island -	19 13 30	158 56 40
Fairway reef -	Centre -	21 0 15	161 45 10
Nereus shoal -	Centre -	20 5 0	160 30 0
Darling shoal -	Western end -	20 22 0	162 20 0
Mellish reef -	Cay beacon -	17 24 40	155 53 30
Lihou reef -	East Extreme -	17 10 30	152 12 40
" -	Observatory cay -	17 7 15	152 6 20
Tregosse islets -	Southern islet -	17 43 0	150 43 0
Coringa islets -	Chilcott islet -	16 50 0	149 58 0
Magdeline cay -	South-eastern islet -	16 35 45	150 19 40
Willis islets -	Middle islet -	16 13 0	150 2 30
Diana bank, P.D. -	-	15 46 0	151 28 0
Bougainville reefs, P.D. -	-	15 12 0	148 59 0
Osprey reef -	Eastern elbow -	15 36 0	149 8 0
Dragon bank -	Centre -	13 51 10	146 36 0
Flinders reefs -	South extreme -	11 49 0	145 49 0
" -	North-eastern projection -	17 53 30	148 28 0
Heralds surprise -	Centre -	17 39 50	148 34 0
Herald cays -	Centre -	17 21 15	148 28 50
Holmes reefs -	North-eastern cay -	16 55 50	149 12 50
Eastern fields -	South extreme of western reef -	16 30 0	147 47 40
Portlock reef -	North-east extreme -	10 2 0	145 45 0
Pandora passage -	North extreme -	9 28 0	144 53 0
Boat reef -	Centre -	9 54 0	144 43 0
Reefs seen by the <i>Claudine</i> and <i>Mary</i> . -	North-east extreme -	9 58 30	144 41 0
	South extreme -	10 28 0	144 27 0
NEW GUINEA.—SOUTH-EAST COAST.			
Fly river -	Tree island, south point -	8 41 0	143 37 0
Cape Blackwood -	Extreme -	7 52 0	144 30 0
Aird Hill -	Summit -	7 27 30	144 31 30
Cape Possession -	Extreme -	8 35 40	146 23 30

TABLE OF POSITIONS.

595

Place.	Particular spot.	Latitude, South.	Longitude, East.
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NEW GUINEA.—SOUTH-EAST COAST—*cont.*

						°	'	"	°	'	"
Mount Yule	-	Summit	-	-	-	8	14	30	146	46	0
Mount Owen Stanley	-	Summit	-	-	-	8	53	0	147	32	0
Dufaure island	-	Summit	-	-	-	10	29	0	149	49	0
South cape	-	Extreme	-	-	-	10	43	30	150	14	0
Port Moresby	-	Jane island, village	-	-	-	9	25	30	147	8	0
Hayter island	-	Possession bay	-	-	-	10	34	30	150	43	15

NEW GUINEA.—NORTH-EAST COAST.

East cape	-	Extreme	-	-	-	10	13	0	150	52	50
Cape King William	-	Village	-	-	-	6	1	0	147	38	0

LOUISIADÉ ARCHIPELAGO.

Teste island	-	West end	-	-	-	10	57	30	151	3	0
Duperré islets	-	Central islet	-	-	-	11	10	30	152	0	0
Duchâteau isles	-	Central isle, observation spot	-	-	-	11	16	40	152	22	45
Flat island	-	Central Hill	-	-	-	11	9	30	153	5	0
St. Aignan island	-	Summit	-	-	-	10	42	0	152	43	0
Sud-est island	-	Mount Rattlesnake	-	-	-	11	31	30	153	27	15
Coral haven	-	Observation reef	-	-	-	11	18	40	153	18	15
Cape Deliverance	-	Extreme	-	-	-	11	23	0	154	18	30
Adele islet	-	South extreme	-	-	-	11	29	10	154	26	10

INDEX.

	Page		Page
a. reef - - -	243, 279	Alligator point - - -	582
— rock - - -	823	Amazon bay - - -	501
— shoal - - -	268	— islands - - -	501
Abbott bay - - -	206	Ambush point - - -	582
— mount - - -	208	Amity point - - -	69
— point - - -	206	—, anchorage - - -	69
Acheron island - - -	217	Amphlett islands - - -	573
Ackers shoal - - -	375	— point - - -	572
Acoineh islet - - -	304	Anchor cay - - -	366, 383, 423
Adele islet, Rossel reef - - -	553	— and Chain islets - - -	531
Admiralty islets - - -	407	Anchorage reefs - - -	535
Adolphus, mount - - -	303, 385	Andrew islands - - -	583
—, Mount, islands - 303-305, 384		Annie inlet - - -	575
—, tides - - -	385	Aoo point - - -	483
Aggie point - - -	572	Aplin island - - -	487
Agnes island - - -	226	—, caution - - -	488
Aignan, St., island - - -	466, 543	— pass and directions - - -	339
—, cape Henry - - -	543	Arch cliff - - -	103, 108
Aird hill - - -	477	— isles - - -	510
— river - - -	476	— rock - - -	131
Akens isle - - -	151	Archer mount - - -	131
Albany island - - -	296	Arden islet - - -	373, 383
—, Alfred point - - -	296	Argyle bay - - -	505
—, Arethusa point - - -	296	Armit islands - - -	188
—, Charlotte point - - -	296	Arthur point - - -	151
—, Cool bay - - -	299	Ashmore banks - - -	318
—, Frederick point - - -	296	Asp, mount - - -	543
—, Paget point - - -	302	— rock - - -	356
—, Robinson bay - - -	296	— shoals - - -	332
—, Seymour point - - -	299	Astrolabe, mount - - -	492
—, Ulrica point - - -	296	Atherton mount - - -	143
—, Vicary bay - - -	296	Attack island - - -	473
— pass, Somerset - - -	298	Auckland creek - - -	120
—, directions - - -	299, 302	Augustus, mount - - -	353
—, tides - - -	299	Aureed isle - - -	374
—, water - - -	299	Avon isles - - -	439
—, York road - - -	300	—, soundings - - -	442
—, port - - -	297		
—, rock - - -	297	b. reef - - -	243, 279
Albert mountains - - -	481	Baffle creek - - -	115
Alert reef - - -	443	— anchorage - - -	116
Alexander reefs - - -	157	Bailey islet - - -	186
Alice river - - -	478	Bald head - - -	479

	Page		Page
Bald hill - - -	154	Barrier reefs, Great, Bligh Boat en-	
Bell's pyramid - -	408	trance - - -	310
-----, Observation rock -	408	-----, Bramble reef -	257
-----, Wheatsheaf rock -	408	-----, Britomart reef -	257
Balls head - - -	21	-----, Cumberland pas-	
Bamborough island -	167	sage - - -	363
Bampfild head - -	328	-----, David reef -	414
Bampton island -	376, 440, 470	-----, Detached reef 315, 420	
-----, reef - - -	489, 441	-----, Northern,	
-----, anchorages -	440, 441	Small 3 -	417
-----, North - - -	440	-----, Southern,	
-----, North-east -	440	Small 310, 416	
-----, Renard island -	441	-----, Yule 313,	
-----, South-east -	441	419	
-----, Tides - - -	441	-----, Direction isle,	
-----, winds - - -	441	North 260	
Banda reef - - -	340	-----, South 260	
Bank of soundings, southern edge of,		-----, directions, within	
Louisiade archipelago -	549	the barrier, between Stead passage	
Banks channel - - -	350-353	and Fair cape - - -	314
-----, Barney isle -	351	-----, East cay 366, 423	
-----, Browne isle -	351	-----, Endeavourreef -	259
-----, Clarke isle -	351	-----, f. reef - - -	260
-----, directions -	352	-----, First 3 mile	
-----, Green islet -	351	opening - - -	309, 416
-----, Messum rock -	352	-----, Flinders entrance	
----- island - - -	353	365, 423	
-----, East point -	353	-----, di-	
-----, Gibbes head -	353	rections - - -	365, 423
-----, mount Augustus -	353	-----, passage 257, 415	
-----, South point -	353	-----, g. reef - - -	260
-----, peak - - -	353	-----, Green islet -	258
Barra castle - - -	225	-----, h. reef - - -	260
Baranjo head - - -	25	-----, Herald prongs -	194
Barn isle - - -	327	-----, Hibernia entrance 311	
Barnard isles - - -	232, 233	-----, Hixon cay -	194
-----, anchorage -	233	-----, Inner limits of	
Barney island - - -	351	256, 259, 262	
----- point - - -	120, 123, 126	-----, k. reef - - -	260
Barometer - - -	17, 388	-----, Louisiade 538, 549, 550	
Barren islets - - -	141, 156	-----, Melville, cape,	
Barrier reef, New Guinea and Louisi-		openings off - - -	308, 416
ade archipelago, 485, 488, 493, 495, 498,		-----, Murray isles 363-365,	
500, 510, 534		423	
-----, Sud-est - - -	550	-----, New Guinea 485, 488,	
Barrier reefs, Great, Anchor cay		493, 495, 498, 500, 510, 534	
366, 383, 423		-----, Nimrod passage 313,	
-----, Bell cay -	195	418	
-----, Black rocks 312, 417		-----, No. 1. Sand-bank	
-----, Black rocks en-		opening - - -	261
trance - - -	312, 418		

	Page		Page
Barrier reefs, Great, No. 5. Sand-bank		Bartle bay - - -	576
opening - - -	309	natives - - -	577
, No. 8. Sand-bank	309	Basilisk bank - - -	554
, Olinda entrance	321,	island - - -	517-519
	422	, Carry island -	519
, One-and-half mile		, Challis head -	519
opening - - -	261, 415	, Goodman point -	518
, Oyster cay -	258	, Jenkins bay -	517
, Pandora entrance,		, mount Goodman -	519
	320, 421	, Negro head -	518
, directions,		, Rat and Mouse islets	519
	321	, Razor islets -	517
, Providential chan-		, Razor point -	517
nel - - -	311	, Useless islets -	517
, Quoin entrance	311,	pass - - -	379
	417	passage - - -	489
, Raine island	316, 420	point - - -	575
beacon		Basses islands - - -	543
	316, 420	Bathurst bay - - -	266
entrance	316	, Bayhill -	266
entrance,		, Channel spit -	266
and Blackwood channel, directions		, water -	266
	454-456	head - - -	267
, remarks	317	Baupal mountain - - -	107
, supplies	317,	Baxter harbour - - -	507
	421	Bay rock - - -	214
, tides	317, 421	Beaufort mount - - -	240
, s. reef - - -	262	Bedford cape - - -	247
, Safe entrance	312, 418	Bedwell group - - -	163, 164
, Second 3 mile		, Calliope island -	164
opening - - -	310, 416	, Emily shoal -	164
, Single rock en-		, George island -	164
trance - - -	313, 419	, Innes island -	163
, Slasher reef -	257	, Lake shoals -	164
, Stead passage	313, 419	, Poynder island -	163
, Swain reefs	193, 194,	Bee and Wasp islets -	583
	412	Beehive islet - - -	512
, tides -	195	Beerwah, Glass-houses -	96
, t. reef - - -	262	Bell point - - -	475
, tides -	424, 425	cay - - -	195
, Trinity opening	258,	rock - - -	533
	415	Bell Vue islands - - -	359
, u. reef - - -	262	Belling river - - -	60
, Vine Horse-shoe		Bellona reefs, Booby reef -	435
shoal - - -	414	, tides -	435
, w. reef - - -	262	, Middle reef -	434
, Wreck bay	312, 418	, Observatory	
, directions		cay - - -	434
	313, 418	, tides -	435
, Yule entrance	362, 422	, N.W. -	435
Barrow point and island - - -	252	, South -	433

	Page		Page
Bellona reefs, South, Sand cay	- 438	Boomerang shoal	- 168
———, tides	- 433	Boot reef	- 366, 451
———, Western breaker	- 434	Bootless inlet	- 491
Ben Lomond hill	- 201	Botany bay	- 19
Bentley bay, natives	- 575	Bougainville reefs	- 448
———, island	- 555	Bounce point	- 544
Berseker mount	- 131	Boundary line	- 67
Bertha lagoon	- 508	Bourke islets	- 373
Bet ialet	- 375	Bousquet point	- 546
Beverly group	- 169	Bowen, cape	- 252
Beware rocks	- 157	———, mount	- 224
Big Ben rock	- 34	———, port	- 143-147
Bird isles	- 290	Bowen, port, anchorage	- 145
———, anchorage	- 291	———, bar	- 144
——— islet	- 81, 427	———, Black rock	- 145
Bishop peak	- 222	———, directions	- 146, 147
——— point	- 302	———, Entrance island	- 144
Black or Skeleton rocks	- 53	———, Flinders mount	- 144
——— head	- 128	———, Observation rock	- 146
——— rock	- 145, 241, 337, 354	———, Perforated point	- 143, 144
——— rocks	- 59, 312, 368, 417	———, Round islet	- 143
——— entrance	- 312, 418	———, supplies	- 146
——— swan rock	- 156	———, tides	- 147
Blackall range	- 97	Bowling-green bay	- 210
Blackney point	- 118	———, cape	- 209
Blackwood bay	- 303	———, directions	- 209
———, Dickey point	- 303	———, light	- 209
———, directions	- 304, 402	Boydong cays	- 291
———, Forbes point	- 303	———, anchorage	- 292
———, tides	- 304	Brady bank	- 326
———, water	- 304	——— hills	- 501
———, bank	- 303	——— point	- 545
———, cape	- 476	Bramble bay	- 84
———, tides	- 482	——— cay	- 368, 381
——— channel	- 318	———, tides	- 368
———, directions	- 454-456	——— channel, directions	- 349
———, tides	- 320	——— haven	- 537
Blanchard island	- 511	——— pass, Louisiade	- 547
Bligh Boat entrance	- 310	——— reef	- 257
——— channel	- 360, 361	——— rocks	- 217
———, directions from east-		Bramston point	- 235
ward	- 360	Breakfast point, Fly river	- 472
——— westward	- 361	Breaksea spit, directions	- 110, 111
——— entrance	- 368, 385, 424	———, tides	- 111
Bloomfield rivulet	- 241	Bremer mount	- 301
Blue Bell rocks	- 281	Brewer islet	- 516
Boat rock	- 69, 533	Bribie island	- 83
Bond islet and reef	- 354	Brierly island	- 545
Bonvouloir islands	- 466, 560	Bright islet	- 557
Booby island, and tides	- 340	——— reefs	- 558
——— reef	- 435	Brisbane	- 87

	Page		Page
Brisbane river - - -	86	Broken bay, pilot signals - -	26
----- lights - - -	85	-----, Pitt water - - -	27
----- tides - - -	87	-----, Refuge bay - - -	28
----- road - - -	84	-----, South-west arm - -	27
----- water, Broken bay -	28	-----, tides - - -	29
Brisk bay - - -	201	-----, head - - -	29
Bristow island - - -	377, 470	Brooke isles - - -	227
Britomart reef - - -	257	Brooker isle - - -	540
Broad mount - - -	181, 134	-----, anchorage - - -	540
----- sound - - -	156-163	Brooks shoal - - -	156
-----, Aquila islet - -	158	Broomfield rock - - -	255
-----, Alexander reefs -	157	Brothers - - -	302, 303
-----, anchorages - -	161	Brothers Hills, island - -	380
-----, Avoid isle - -	157	-----, Three - - -	55
-----, Beware rocks - -	157	Broughton isles - - -	48-51
-----, channel - - -	156	-----, anchorages - -	50
-----, channels - - -	160	-----, Esmeralda cove - -	49
-----, Charon point - -	158	-----, Inner rock - - -	50
-----, Crocodile banks -	160	-----, North rock - - -	49
-----, directions - -	161, 162	-----, South rock - - -	49, 51
-----, Flat isles - - -	157	Brown, mount - - -	501
-----, Flock Pigeon isle -	158	Browne isle - - -	351
-----, Hoogly creek - -	160	Bruwer islands - - -	509
-----, Light - - -	159	-----, approaches - -	510
-----, Middle shoal - -	157	-----, produce - - -	509
-----, North point cays -	157	Buchan mount - - -	240
-----, ----- islands -	156	Buchanan rock - - -	62
-----, pilots - - -	159	Bundaberg - - -	114
-----, Sandy shoals - -	157	Bunker group - - -	136
-----, St. Lawrence creek -	159	-----, No. 1. islet - -	136
-----, tides - - -	161, 162	-----, No. 2. islet - -	136
-----, Turn island - - -	157	-----, No. 3. islet - -	136
-----, Upper head - - -	159	Buoys and beacons, Moreton bay	77, 90
-----, water - - -	161	-----, Rous channel - -	71
-----, Waverley creek -	159	Burdekin river, mouths of -	210, 211
Broken bay, and anchorage	25, 26	Burke isle - - -	350
-----, bar - - -	26	Burkitt road - - -	155
-----, Baranjo head - -	25	Burley head - - -	68
-----, Brisbane water - -	28	Burnett islet - - -	539
-----, Challenger head -	28	----- river - - -	113
-----, Cowan creek - -	28	-----, bar - - -	113
-----, Croppy point - -	29	-----, Bundaberg - -	114
-----, directions - - -	29	-----, directions - -	115
-----, East and West reefs -	25	-----, Harriet island - -	115
-----, Eliot isle - - -	26	-----, Lights - - -	114
-----, Hawk head - - -	25	-----, pilot - - -	114
-----, lights - - -	28	-----, signals - - -	114
-----, Middle bank - - -	27	-----, tides - - -	115
-----, North-West arm and		Burru point - - -	103, 113
-----, Hawkesbury river	28	----- river - - -	113
-----, Observation head -	27	Bush islet - - -	297

	Page		Page
Bushy islet - - -	294	Carry island - - -	519
Bustard bay - - -	116	Cartwright point - - -	97
— head - - -	117	Castle island and reef - - -	358
—, lights - - -	117	— hill - - -	212, 215, 267
—, Outer rock - - -	117	Castori island - - -	511
—, tidal stream - - -	117	Casuarina point - - -	237, 238
Button islet - - -	516, 558	Catamaran bay - - -	508
— rock - - -	544	Catharine Hill bay - - -	81
Byron, cape - - -	66	— island - - -	575
—, bay and reef - - -	66	Cato bank - - -	426
— tides - - -	66	—, anchorage - - -	427
— islet - - -	528	— island - - -	426
c. reef - - -	244, 270, 280, 342	—, beacon - - -	426
Cabbage Tree bay - - -	3	— reef - - -	426
— head - - -	84	—, tides - - -	427
— island - - -	42	Caution bay - - -	467
Cairncross islet - - -	293	— point, natives - - -	581
Cairns harbour - - -	238	—, anchorage - - -	581
— tides - - -	239	Cawarra shoal - - -	34
—, township, water - - -	239	Centipede bay - - -	564, 565
Caloundra head - - -	74, 82	Centre bank, Keppel bay - - -	130
Calvados islands, natives - - -	538-542	Cette island - - -	502
Cambridge point - - -	304	Chads bay - - -	576
Camden haven, and head - - -	56	Challis head - - -	519
Campbell isle - - -	372, 383	Channel islet - - -	345
— reef - - -	345	— rock, cape Melville - - -	255
Cannibal group - - -	149	—, Flinders passage - - -	333
Canoe cay - - -	371	—, light vessel - - -	256
— islet - - -	347	—, rocks, cape Sandwich - - -	226
Cap islet - - -	380	—, spit - - -	266
Cape islet - - -	149	Chapman reef - - -	333
Capel bank - - -	411	Charles Louis mountains - - -	473
Capricorn, cape and light - - -	128	Charlie islet - - -	563
—, telegraph - - -	128	Charlotte head - - -	53
— channel - - -	197, 394	— point - - -	296
— group, directions - - -	136-140	—, Princess, bay - - -	269
—, Heron, islet - - -	139	Chaumont islet - - -	549
—, Irving reef - - -	138	Cheshunt bay - - -	498
—, Masthead islet - - -	138	— river - - -	498
—, North reef - - -	138	Chesterfield cape - - -	569
—, North-west islet - - -	139	— reefs - - -	436-439
—, One Tree islet - - -	136	— anchorage - - -	438
—, Polmaise reef - - -	138	—, anchorage islets - - -	436
—, productions - - -	140	—, Avon isles - - -	439
—, Rock Cod shoal - - -	139	—, tides - - -	439
—, tides - - -	140	—, Eastern barrier - - -	436
—, Wreck islet - - -	137	—, Long island - - -	437
Cardwell - - -	228	—, passage - - -	438
Caroline rock - - -	279	—, tides - - -	438
Carpentaria gulf - - -	326	—, passage the - - -	437
Carrington point - - -	579	—, soundings - - -	438, 442

	Page		Page
Chesterfield reefs, South-western barrier	436	Coffs islands	60
—, Western barrier	438	Cole islands	253
Cheviot island	166	Coliseum inlet	119
Chilecott rocks	218, 275	Collingwood bay	579, 580
China strait	513, 514	—, Fir tree point	579
—, tides	567	—, Keppel point	580
—, water	514	—, Nelson cape	579
Christina peak	97	—, soundings	579
Clack islet	268	—, Trafalgar mount	579
Claremont isles, Nos. I. and II.	272	—, Victory mount	579
—, Nos. III., IV. and V.	272	Collinson point	580
—, anchorage	272	Colombier point	499
—, reefs	274	Comboyuro point, light	75
—, point	269	Comet rock	155
Clarence, mount	501	Condé point	546
—, peak	62	Cone point	506
—, river	62	Conical rock	248
—, Grafton	62	Connor banks	155
—, bar	63	—, bluff	128
—, directions	63	—, island	522
—, Light, South head	63	—, islet	164
—, North spit	63	—, rock	152
—, pilots	63	Constantine point	235
—, tides	63	Conway, cape	179
Clarke island	7, 351	Cook island and anchorage	67
Cleveland bay	211	—, mount	242
—, Crocodile creek	211	—, town	245
—, directions	215	Coolum hill	97
—, tides	213	Cooper point	233, 234
—, cape	211	Coral haven	547-549
—, point, light	90	—, Bramble pass	547
Cliff islands	269	—, Dip reef	548
— islet	487	—, directions	549
— point	143	—, Observation reef	548
Clinton, cape	143	—, Pig island	548
Cloudy bay	499	—, patches, detached, Louisiade	551
—, Colombier point	499	—, sea	412-452
—, Eugenia island	499	—, description	412-414
—, Percy island	499	Cordelia rock	216
—, Robinson harbour	500	Coringa islets	445
—, Sewell island	499	Cornwall, cape	328
—, mountain	508	Cottier bank	130
Clump hill	482	Coutance island	498
— point	231	— reef	457, 495
Coast island	514	Cowan Cowan point, light	75
Cockburn reef and islands	287, 288	Cretin cape	587
Cocked-hat islet	561	— islands	587
Cockscomb mount	131	Crocodile creek	211
Cocoa-nut isle	374, 388-385	Cromwell mount	588
— point	355	Crowdy head	54, 55
— rock	510	— bay	55

	Page		Page
Cumberland islands -	184-192	Curtis port, Barney point -	120
, Bailey islet -	186	, buoys -	123
, Cid island -	191	, Calliope river -	120
, Dent island -	189	, directions -	125-127
, passage -	189	, East banks -	122
, Fairlight rock -	187	, Facing island -	127
, Hamilton island -	189	, Gatecombe head -	121
, Haycock island -	189	, Gladstone -	120
, Hayman island -	192	, Jenny Lind bank -	123
, Henning island -	190	, Larcom, mount -	119, 126
, Hook island -	191	, Lights -	125
, Juan rock -	185	, Manning reef -	121
, k., k. 1. and k. 2 isles -	185	, Middle bank -	123, 124
, k. 4. and k. 4½ isles -	185	, Narrows, the -	124
, Kennard rock -	187	, North channel -	123
, Keyser island -	187	, Observation point -	121
, 1., 1 1. 1 2. 1 3.		, Oyster rock -	121
and 1 4. isles -	185, 186	, Quoin island -	121
, Langford island -	192	, repairs -	125
, Lindeman island -	188	, Rich rock -	126
, Long rock -	187	, Seal rocks -	122
, m. isle -	186	, Settlement point -	122
, Mansell island -	188	, South channel -	123
, Pentecost isle -	189	, Trees inlet -	120
, Platybus rock -	188	, point -	120
, Rocky islet -	188	, supplies, water -	125
, Seaforth island -	188	, tides -	125
, Shaw island -	187	, View hill -	121
, Singapore rock -	186	, West banks -	123
, Sir James Smith		Cussar river -	469
group, Linné peak -	186		
, Spitfire rock -	188	d. reef -	244, 270, 280, 342
, St. Helen rock -	187	Daintree river -	239
, Thomas island -	187	, directions -	240
, Three rocks -	185	, tides -	240
, Tides -	192	Dalrymple isle -	372, 383
, Whitsunday island -	190	point -	202
, Wind and weather -	193	Danger point and anchorage Tweed	
passage -	363	river -	66, 67
Cupola, cape -	481	island -	167
Curaçoa island -	220	reefs -	67
Curlew island -	168	, clearing marks -	68
Curphy shoal -	55	Dangers, doubtful, Outer route -	411, 412
Currents -	389, 390	Capel bank -	411
Curtis, channel -	196, 393	, Favorite reef -	412
, tides -	394	, Middleton island -	411
island -	128	, islands -	412
port -	119-127	, reef -	412
, anchorage -	124	, rock -	412
, Auckland creek -	120	Darling harbour -	11
, point -	120		

	Page		Page
Darling reef - - -	441	Direction, cape - - -	277
Darnley island - - -	369	, natives - - -	278
, anchorage - - -	369	, isle, South - - -	260
, dangers near - - -	370	, North - - -	260
, natives - - -	369	Directions, Albany pass - - -	299, 302
, tides - - -	370	, Banks channel - - -	352
, Treacherous bay - - -	369	, Blackwood bay - - -	304
David reef - - -	414	, channel - - -	454-456
Dawson cape - - -	570	, Bligh channel - - -	360, 361
island - - -	559	, Bowen, port - - -	146, 147
strait - - -	571	, Bowling-green, cape - - -	209
Dayman channel - - -	344	, Bramble channel - - -	349
, directions - - -	345	, Breaksea spit - - -	111
island - - -	324	, Brisbane river - - -	95
, mount - - -	505	, Broad sound - - -	162, 163
point - - -	101, 105, 112	, Broken bay - - -	29
Deaf Adder bay - - -	588	, Broughton islands - - -	50, 51
, anchorage - - -	588	, Burnett river - - -	115
Deboyne islands - - -	543	, Capricorn group - - -	140, 141
Deception bay - - -	88, 479	, channel - - -	394
, entrance ialets - - -	479, 480	, Clarence river - - -	63
Deedes cape - - -	570	, Cleveland bay - - -	215
islets - - -	558	, Conway cape to Gloucester	
Deliverance, cape - - -	465, 552	island - - -	394
D'Entrecasteaux islands - - -	466, 568	, Coral haven - - -	549
Denison fort - - -	8	, Curtis channel - - -	393, 394
, port - - -	202-206	, port - - -	125-127
, anchorage - - -	203	, Daintree river - - -	240
, Bowen - - -	203	, Dayman and Simpson	
, Bramston hill - - -	203	channels - - -	345
, Dalrymple point - - -	202	, Denison port - - -	204-206
, Stone island - - -	202	, Double point to Cooper	
, directions - - -	204-206	point - - -	233
, Gordon mount - - -	203	, Dufaire island - - -	504
, lights - - -	204	, Dunk island - - -	231
, North head - - -	202	, Endeavour river - - -	246
, Observatory point - - -	202	, Endeavour river to cape	
, pilots - - -	202	Bedford - - -	247
, tides - - -	204	, Endeavour strait - - -	329-331
, water - - -	204	, Fitroy river - - -	124
Dent island - - -	189	, Flinders entrance - - -	365
Detached reef, Great - - -	315, 420	, Flinders passage - - -	333
, Northern small - - -	311, 417	, Gibbons island route - - -	567
, Southern small - - -	310, 416	, Goschen strait - - -	566
, Yule - - -	313, 419	, Great Sandy strait - - -	101-103
Diamond or Indian head - - -	56	, Harrington inlet and	
Diana bank - - -	448	Manning river - - -	54
Dido rock - - -	220	, Hervey bay - - -	113
Didymus island - - -	516	, Hillsborough, cape, to Midge	
Dinner island - - -	514	point - - -	178
Dip reef, Coral haven - - -	548	, Hinchinbrook port - - -	229

	Page		Page
Directions, Inner route, Sydney to		Directions, Richmond river -	65
Torres strait - - -	392-403	Rockingham channel -	223
Inner route, Torres strait		Simpson channel -	343
to Sydney - - -	403, 404	Stead passage and adjacent	
Jackson, port, when not to		openings to the mainland -	314
enter - - -	18, 19	Stephens, port -	44-47
Jackson, port, from the		Stephens, port, to Sandy	
southward - - -	19-21	cape - - -	48-111
Jackson, port, from the		Stradbroke island to Look-	
eastward - - -	22	out point - - -	69
Jackson, port, from the		Trial bay - - -	59
northward - - -	23	Tribulation, cape, to Weary	
Jackson, port working		bay - - -	242
into - - -	24	Turtle group - - -	251
Keppel bay - - -	134, 135	Wide bay - - -	100
Louisade archipelago	554, 555	Wreck bay - - -	313, 418
Macquarie, port - - -	58	York road and Evans bay,	
Manning river - - -	54	or Blackwood bay - - -	402
MacLeay river - - -	59	Yule channel - - -	346
Middle passage - - -	320	Discovery bay, supplies -	529
Molle, port - - -	181	Docks, &c., port Jackson -	10, 11
Moresby port - - -	491	Domaru river - - -	499
Moreton bay, northern		Donovan shoal - - -	150
channels - - -	91-95	Dot islet - - -	516, 585
Pumice-stone strait - -	83	Double Duke hill - - -	62
Murray islands - - -	365	Cone island - - -	183
New Guinea - - -	554, 555	island - - -	239, 340, 384
Nimrod entrance - - -	418	point - - -	98
Normanby sound - - -	337	isle - - -	169, 239
North channel - - -	288	point - - -	232
North point of Weary bay		rocks - - -	155
to Walker point - - -	242	Sloping hill - - -	112
openings between lat.		Doubtful cape - - -	571
12° 30' S. and Raine island -	456	Douglas port - - -	239
Outer route, Sydney to		tides - - -	239
Raine island - - -	452-454	Dove islet - - -	374, 383
Outer route, making the		Dowar islet - - -	364
channels through the barrier -	453	Dragon bank - - -	449
Outer route, anchoring -	454	Drumfish shoal - - -	157
Torres strait		Dryander, mount - - -	182
to Sydney - - -	460	Duchâteau entrance - -	550
Pandora entrance - - -	321	islands - - -	538
Papua gulf - - -	478	Duchess cove - - -	569
Papuan, or Great North-		islet - - -	569
east channel - - -	383-386	Ducie cape - - -	575
Pioneer river - - -	175, 176	Dudfield port - - -	506
Pollard channel - - -	288	Dufaure island - - -	503
Prince of Wales channel		anchorage - - -	504
342, 343, 402		Dugdale rock - - -	277, 400
Raine island and Black-		Duke islands - - -	167
wood channel - - -	454-456	Dumoulin isles, caution -	512

	Page		Page
Dumpling islets - - -	- 585	Eliot mount - - -	- 209
Duncan group - - -	- 347	Elizabeth island - - -	- 489
-----, Logan rocks	- 348	----- reef - - -	408-410
-----, Spencer island	- 347	-----, anchorage - - -	- 409
-----, ----- rocks	- 347	-----, current - - -	- 410
-----, Phipps island	- 348	-----, Life-boat - - -	- 409
-----, Whale island	- 348	-----, tides - - -	- 410
-----, Wilson islands	- 348	Elliot, Lady, islet - - -	- 135
Dungeness island and reef -	- 379	Ellengowan island, Fly river	- 473
Dunk island - - -	- 231	----- bay - - -	- 506
-----, anchorage, water	- 231	Ellis channel - - -	- 338
-----, directions - - -	- 231	-----, anchorage - - -	- 338
-----, Mound islet - - -	- 231	-----, directions - - -	- 338
-----, tides - - -	- 231	-----, Hovell bank - - -	- 338
Dunwich - - -	- 89	-----, rock - - -	- 338
Duperré islets - - -	- 537	-----, Madge reefs - - -	- 338
-----, Bramble haven	- 537	Ellis channel, Wilkie bank -	- 338
Dutfield rock - - -	- 375	Emily shoal - - -	- 164
Dyke Acland bay - - -	580, 581	Endeavour reef - - -	- 259
-----, soundings - - -	- 581	----- river - - -	244-246
-----, Sud-est cape - - -	- 581	-----, bar - - -	- 245
		-----, Cooktown - - -	- 245
		-----, directions - - -	246, 247
e. reef - - -	244, 270, 280	-----, Grassy hill - - -	- 244
Eagle islet - - -	- 249	-----, mount Cook - - -	- 246
----- point - - -	- 506	-----, Palmer river - - -	- 245
----- rock - - -	- 328	-----, Sachs spit - - -	- 246
----- rocks - - -	- 506	-----, tides, signals - - -	245, 246
Earle island - - -	- 541	----- strait - - -	323-331
East banks - - -	76, 122, 150	-----, Bampfild head - - -	- 329
----- cape, New Guinea - -	- 530	-----, Barn isle - - -	- 327
----- cay - - -	366, 383, 423	-----, Brady bank - - -	- 326
----- Entrance islet - - -	- 480	-----, Cornwall, cape - - -	- 328
----- islets - - -	- 292	-----, Dayman isle - - -	- 324
----- point, Banks island -	- 353	-----, directions - - -	329, 330
----- strait, islet - - -	- 341	-----, directions from the	
Eastern fields - - -	450, 457	westward - - -	330, 331
Eborac isle - - -	- 301	-----, Eagle rock - - -	- 328
Eddystone island, Louisiade	- 540	-----, Entrance island - - -	- 328
----- reef - - -	- 540	-----, Heroine rock and	
Edgecumbe bay, and cape -	- 301	Gibson shoal - - -	- 325
-----, directions - - -	205, 206	-----, Inskip banks - - -	- 327
Edith, breaker - - -	- 52	-----, Jardine river - - -	- 326
----- river - - -	- 486	-----, Lihou, port - - -	- 328
Edward's shoal - - -	- 164	-----, Meddler isle - - -	- 324
----- rock - - -	278, 341	-----, Mootes head - - -	- 325
Edwin rock - - -	- 183	-----, Packe isle - - -	- 328
Est division of Banks island	- 353	-----, Peak point - - -	- 323
Eight fathoms patches - -	- 30	-----, Possession island - -	- 324
Electric telegraph, port Jackson	- 2	-----, Rattlesnake point	
Eliot islet - - -	- 26		328, 331

	Page		Page
Endeavour river, Red banks	- 327	Farm peak	- 507
—, Red island	- 326	Farquhar, Governor, group	- 448
—, Rothsay banks	- 329	— inlet	- 54
—, Simpson bay	- 324	Favorite reef	- 412
—, soundings	- 329	Feltham cone	- 210
—, tides	- 325, 328	Ferguson island	- 571, 572
—, Wallis isle, Red	- 327	—, Aggie point	- 572
—, —, Woody	- 327	—, Amphlett point	- 572
—, Woody isles	- 325	—, Burton point	- 572
—, Yule point	- 328	—, Doubtful cape	- 571
Engineer group	- 556, 557	—, Kilkerran mount	- 573
—, Butchart island	- 556	—, Labillardière cape	- 572, 573
—, Skelton island	- 556	—, Llewellyn point	- 572
—, Slade island	- 556	—, Mourilyan cape	- 572
—, Watts island	- 557	—, Pioneer point	- 572
England shoal	- 295	—, Seymour bay	- 572
Enterprise reef	- 172	—, Vinall cape	- 572
Entrance island, port Bowen	- 144	—, spit	- 108
—, Endeavour strait	- 328	Fingal point, light	- 67
—, Aird river	- 476	Finger peak	- 493
Ereepah mount	- 45	Fir-tree point	- 579
Ernest, mount, island	- 349, 384	First 3-mile opening	- 309, 416
—, anchorage	- 350	Fish rock	- 59
Escape river	- 293, 295	Fisherman islands	- 488
Eshelby island	- 184	—, natives	- 488
Eugenia islet	- 499	Fitzroy island	- 237
Eurimbula creek	- 116	—, tides	- 237
Eva islet	- 226	—, water	- 237
Evans bay	- 300	— river	- 132-134
—, anchorage	- 300	—, Buoys and beacons	- 132
—, directions	- 302, 402	—, directions	- 134
—, Sextant rock	- 301	—, lights, and signals	- 138
—, tides	- 302	—, Rockhampton	- 132
—, water	- 301	—, tides	- 133
— head	- 64	Flat island, Calvados chain	- 542
— reefs	- 64	— isles	- 157
Excellent point	- 576	— islet	- 143, 355, 558
		— rock, and Caution	- 70
		Flat Top hill	- 66
f. reef	- 260, 270, 281	— islet	- 175
Facing island	- 127	Flattery, cape	- 247
Fair cape	- 281	Flinders, cape	- 267
Fairfax harbour	- 490	— entrance	- 365, 423
Fairway reef	- 441	—, directions	- 365, 423
False cape	- 237	— group, anchorage	- 267, 268
— islet	- 587	—, Castle hill	- 267
Family islands	- 230	—, natives	- 268
Farewell islets	- 358	—, tides	- 268
Farm bay	- 507	—, mount	- 144
— cove	- 8	—, passage	- 257, 333, 415

	Page		Page
Flinders passage, Channel rock	- 333	Gardner banks	- 109
—, Chapman reef	- 333	Gatcombe head	- 121
—, directions -	- 333	— lights	- 125
—, Hannah rock	- 333	Geographic position, Booby island	- 340
—, Nereid-rock	- 333	—, Coral haven	- 548
—, Scott rocks	- 333	—, Sydney	- 8
— reefs	- 74, 449	—, Sextant rock	- 301
Flinn bay and anchorage	- 525, 526	George point	- 182, 225
Flint and Steel bay	- 27	— river	- 475
Florence island	- 359	Georgie island	- 491
Flounder reef	- 563	Gerard bank	- 339
Fly islets	- 584	Ghibber, the	- 337
— point	- 228, 295	Gibbes head, Banks island	- 353
— river	- 472-474	Gibbons island	- 562
—, islands at mouth of	- 473	—, coral patches	- 562
— road	- 42	—, Route	- 567
Foolscap rock	- 534	Gibson shoal	- 325
Forbes islets	- 282	Gilmore bank	- 293
Forde rock	- 55	Gladstone	- 120
Formantine mound	- 240	Gladly inlet	- 234
Fortescue strait	- 519	Glare of Sun	- 458
Fortification point	- 587	Glasgow port	- 503
Frankland islands, I., II.	- 235	Glass Houses	- 96
—, High, isle	- 335	Glen ialet	- 578
Fraser (Great Sandy) island	- 108	Glenton island	- 523
Frederick point	- 296	Gloucester, cape	- 182
— reef	- 430	— island	- 183
—, anchorage sound	- 430	Gneering shoal	- 97
—, Observatory cay	- 430	Goode island	- 365, 339
—, tides	- 431	—, Quoin point	- 337
Freeburn rock	- 62	—, signal station	- 335
Freeman channel	- 78	Goodenough bay natives	- 577
Frere cape	- 576	— island	- 573, 574
Freshwater bay	- 481	—, Breakfast cove	- 574
— point	- 172	—, Goodenough mount	- 574
Friday island	- 336	—, Needham point	- 574
—, Webb point	- 337	—, Parkes cape	- 573
Frith island	- 573	—, Rawlinson cape	- 574
Funnel, mount	- 165	—, Ryley cape	- 574
Fyfe bay	- 506	—, Watts cape	- 574
		Goodman mount	- 519
g. reef	- 260, 270, 282	— point	- 518, 527
Gales, Sydney to port Stephens	- 38	Goold isle, anchorage	- 227, 228
Galley reach	- 486	—, water	- 226
Gallows reef	- 561	Göschén strait	- 563
—, Jack and Ketch	- 561	—, caution	- 561
Gannet rock	- 155, 161	—, directions	- 566
Gap, the	- 2	—, tides	- 563, 567
Garden island, Observation place	- 8	Goulvain island	- 571
— isle, Louisiade	- 549	Gower, mount	- 406

609

	Page		Page
Grace islet - - -	560	Halfway islet - -	292
Grafton, cape - -	236	_____ island - -	372, 374
_____ city - - -	62	Halifax bay - - -	216
Grange island - -	500	_____, Round hill -	216
Grant islet - - -	527	Halliday point - -	53
Grants head - - -	56	Hall sound - - -	484
Grass island, Louisiade - -	544	_____, Ethel river -	484
Grassy island - -	183	_____, Hilda river -	484
_____ point - - -	521	Hamelin rocks - -	358
Great North-east channel - -	367-386	Hammond island - -	334, 384
_____ Palm island - -	217	_____, Kate point -	337
_____, Calliope point -	218	_____, Powell point -	337
_____, Challenger bay -	219	_____ rock - - -	334
_____, Fawn head - -	218	Hannah rock - - -	166, 333
_____ Sandy (Fraser) island -	108	_____ bank - - -	373
_____ strait - - -	100-107	Hannibal islets - -	291
_____, Middle bluff -	105	Harbour duces, port Jackson -	12
_____, North bluff -	105	Hardman islet - - -	559
_____, Dayman point -	101, 105	Hardy, islet - - -	580
_____, directions -	100, 106	_____ point - - -	580
_____, Elbow point -	101	_____ Sir Charles, isles -	286
_____, Hook point -	101	_____, water - - -	286
_____, lights - - -	105	_____, tides - - -	286
_____, Maryborough -	103	Harrington inlet and Manning river -	54
_____, _____ river -	102	_____, bar - - -	55
_____, Pearl bank -	105	_____, directions -	54
_____, pilots - - -	106	_____, light, pilot signals -	54
_____, Ship channel -	105	_____, tides - - -	54
_____, Snout point -	101	_____ rock - - -	254
_____, South white cliffs -	101	_____ shoal - - -	295
_____, Stewart island -	101	Harris peak - - -	240
_____, tides - - -	103, 106	_____ island - - -	571
_____, Vernon point -	104	Harrison islet - - -	149
_____ Sirius cove - -	9, 11	Harvey rocks - - -	376
Green hill - - -	165	Hastings river - - -	57
_____ islet - - -	59, 258, 351	_____ point - - -	67
_____, Calvados chain -	541	Haszard islets - - -	558, 559
_____ mound, port Macquarie -	57	_____, Button islet -	558
Grenville, cape - - -	285, 401	_____, discoloured water -	559
Grimston point - - -	182	_____, Flat islet - -	558
Grind reef - - -	564	_____, Night bank - -	559
Gumbrell island - - -	183	_____, North islet - -	559
Gunpowder regulations, Sydney -	14	Havannah islands - -	220
Guy rock - - -	67	Hawk head - - -	25
Gympie, goldfields - -	98	Hawke, cape - - -	48, 53
		Hawkesbury island -	346
		_____ reefs - - -	346
		_____ river - - -	28
H. reef - - -	260, 270, 283	Hawkings point - -	213
H. H. or Guard Fish cluster -	168	Hay point - - -	173
Haggerstone island - -	285	_____, anchorage - -	173
Haines island - - -	522		

	Page		Page
Hayman island - - -	193	Hinchinbrook island, George point -	225
----- rock - - -	218	-----, Hillock point -	225
Hayter island - - -	514	-----, Pitt mount -	225
-----, anchorage - -	515	-----, Ramsay bay -	226
-----, Bead islet - -	515	-----, Richards cape	226
-----, Haines mount -	514	-----, Sandwich cape	226
-----, Peninsula point -	515	-----, Stralock mount	225
-----, Possession bay -	514	-----, port - - -	228
-----, Scramble point -	516	-----, Cardwell -	228
-----, Steep point - -	515	-----, Directions -	229
-----, tides - - -	515	Hixson cay - - -	194
Head islands - - -	492	Holborne isle - - -	206
----- islet - - -	516	Hole in the Wall - - -	25
Heads, Sydney - - -	2-4	Holmes reefs - - -	450
Heath island and Mission station -	511	Holnicote bay - - -	581
----- point - - -	331, 511	Holt island - - -	149
----- reefs - - -	510	Home islands - - -	285
----- rocks - - -	273	Hood bay - - -	495, 496
Hecate point - - -	228	----- lagoon - - -	495
Henderson reef - - -	545	----- point - - -	494
Henry Miller reef - - -	486	Hook island - - -	191
Herald cays - - -	450	----- point, Wide bay -	99
----- island - - -	216	Hoop-iron bay - - -	521
----- prongs - - -	194	Hope islands - - -	243
Herald's surprise - - -	450	----- and Thomas ialets -	201
Herbert river - - -	222, 224	Horn island - - -	331
Hercules bay, soundings - -	583	-----, Horned hill - -	331
-----, Andrew islands -	583	-----, King point - -	333
-----, Broken range - -	583	Hosken island - - -	583
Heroine rock - - -	325	Hovell bank - - -	338
Heron islet - - -	139	----- rock - - -	338
Hervey bay - - -	112	----- shoal - - -	345
----- tides - - -	112	Howe channel - - -	77
----- islands - - -	147	-----, Lord, island - -	406-408
----- Clara group - -	147	Howick group - - -	254
----- Dome islet - -	147	Hull island - - -	560
Hibernia entrance - - -	311	----- river - - -	230
High Double mount - - -	153	Hummock hill - - -	119
----- isle - - -	235	----- mount - - -	153
----- peak - - -	182	Hummocky island - -	129
----- island - - -	166	Hunter bay - - -	4
-----, Rossel island - -	552	----- river - - -	31
----- Round hill - - -	275	Huon gulf - - -	584-587
Hillock point - - -	225	-----, anchorage - -	586
Hillsborough, cape - - -	177	-----, soundings - -	585-587
Hinchinbrook island - - -	224	-----, tides - - -	584
-----, Bowen mount	224	Hutchison rock - - -	426
-----, Diamantine - -		----- shoal - - -	74
----- mount - - -	225	Huxley island, Louisiade -	541
-----, Barra castle -	225	----- point, Joannet island -	546
-----, Eva islet - -	226	Hyacinth shoal - - -	184

	Page		Page
1. islet - - - -	270	Island point - - -	238
— reef - - - -	249, 271, 283	— bluff - - - -	503
Ida isle - - - -	300	Islands, doubtful - -	411, 412
— point - - - -	300	— and reefs between Sandy cape	
Imbert islet - - -	534	and Keppel isles - -	185-142
Ince point - - - -	332		
Indian head - - - -	109		
— or Diamond head - -	56		
Inner route, Sandy cape to cape		Jabbering islets - - -	579
Gloucester - - - -	196-200	—, anchorage - - -	579
—, Capricorn channel	197, 394	Jack and Ketch islets - -	561
—, Curtis channel	196, 393	Jackson, port - - -	1-23
—, directions, Sydney to		—, anchorage inside - -	10
Torres strait - - -	392-403	—, Balls head - - -	21
—, directions, Torres strait		—, Bar and Flats - - -	5
to Sydney - - - -	403, 404	—, Blues point - - -	21
—, Eastern or Outer chan-		—, Bottle and Glass spit	6
nel - - - -	198	—, Bradley point - - -	5
—, Gloucester, cape, to the		—, Cabbage Tree bay - -	3
Palm isles - - - -	263	—, Camp cove - - -	21
—, Grafton, cape, to Lizard		—, Careening point - -	9
island - - - -	264	—, channel, East - - -	7
—, Grenville, cape, to cape		—, —, West - - -	6
York - - - -	307	—, Chowder bay and head	5
—, Lizard island to cape		—, Clarke island - - -	7
Melville - - - -	264, 265	—, Cockatoo island - -	10
—, Melville, cape, to cape		—, Darling harbour - -	9, 11
Sidmouth - - - -	306	—, Dawes point - - -	8
—, Palm isles to cape Grafton	263	—, Denison, fort - - -	8
—, Percy isles to cape		—, directions, when not	
Gloucester - - - -	198	to enter - - - -	18, 19
—, remarks on - - -	391, 392	—, directions from the	
—, season for making pas-		southward - - - -	19, 21
sage by - - - -	392	—, directions from the	
—, Sidmouth, cape, to cape		eastward - - - -	22
Grenville - - - -	307, 400, 401	—, directions from the	
—, Whitsunday passage -	392	northward - - - -	23
—, tides - - - -	197, 199, 264, 265	—, directions, working in	2
—, Western or Inner channel	199	—, docks, patent slips, &c.	
Innes head - - - -	119		10, 11
— island - - - -	163	—, Double bay - - -	9
Inskip banks - - -	327	—, entrance - - - -	3
— hills - - - -	501	—, Fairway - - - -	9
— point - - - -	98-100	—, Farm cove - - - -	8
Inverary bay - - -	510	—, Garden island - - -	8
Ipili or o reef - - -	335	—, George head - - -	5
Irving reef - - - -	138	—, Goat island - - -	21
Isabel mount - - -	97	—, Green point - - -	6
— cove - - - -	506	—, Grotto point - - -	4
Island head - - - -	147	—, head, Middle - - -	4
— creek - - - -	148	—, North, Inner - - -	3
		—, Outer	

	Page		Page
Keppel bay, Lights -	130, 133	Lansdown reef -	277
——, Little Sea hill -	130	Larcom mount -	119
——, pilot station -	130	Larpent bank -	339
——, Second Lump, Arch rock	131	Laseinie islands -	559
——, Split rock -	131	——, Dawson island -	559
——, tides -	133	Leach mount -	222
——, Timandra bank -	129	Lebrun islets -	534
——, cape -	129	Ledge, South -	303
——, rocks -	129	——, North -	303
——, isles -	141, 142	Leicester island -	148
——, Barren or First Lump -	141	Lejeune islet, Louisiade -	536
——, Child rock -	142	Lennox head -	65
——, Conical rocks -	142	Leocadie isles -	509
——, Egg rock -	142	Leone mount -	62
——, Great Keppel -	141	Lights, Jackson port -	2, 5, 8
——, Humpy -	141	——, Bowling Green cape -	209
——, Man and Wife rocks -	142	——, Burnett river -	114
——, Miall -	141	——, Bustard head -	117
——, North Keppel -	142	——, Capricorn cape -	128
——, Outer rock -	142	——, Claremont isles -	273
——, Pleasant -	142	——, Clarence river -	63
——, Sloping -	142	——, Cleveland point -	90
——, tidal stream -	142	——, Denison port -	204
—— point -	496, 580	——, Fingal point -	67
Kilkerran mount -	573	——, Fitzroy river -	133
Killerton cape -	581	——, Flat Top island -	176
—— islands and anchorage	529	——, Gatcombe head -	125
——, mount -	530	——, Great Sandy strait -	105
——, sand bank -	581	——, Harrington inlet -	54
Kimberley cape -	237, 240	——, Keppel bay -	130
King reefs -	232	——, Lady Elliot island -	135
—— William cape -	588	——, Low isles -	241
Kirkville hills -	227	——, Moreton bay 72, 73, 75, 85, 90	
Kiwai river -	472	——, Newcastle -	32
Kolan river -	115	——, North reef -	138
Korogoro point -	59	——, Piper island -	283
Kosmann islet -	536	——, Richmond river -	65
——, anchorage -	536	——, Ross creek -	213
Kuper range -	585	——, Sandy cape -	109
		——, Solitary islands -	62
		——, St. Lawrence creek -	159
		——, Stephens port -	41
L, 1 1. and 1 2. isles -	185, 186	Lihou reef and cays -	443
1 3. and 1 4. isles -	186	——, Herald passage -	444
1. reef -	249, 272, 283	——, Observatory cay, turtle -	444
Labillardière cape -	572, 573	——, soundings -	444
Lady Elliott islet -	135	——, tides -	445
—— light -	135	Lily river -	486
—— tides -	136	—— island -	489
Laggers point -	59	Lindeman island -	188
Laguna bay -	97, 98	Litabella creek -	115
Lalokie river -	485, 491		

	Page		Page
Little Sea hill lights -	130	Maben islet -	524
Lizard island and anchorage -	250	Mabudani hill -	470
——, tides -	251	Macalister range -	240
——, water -	250	Mac'Leay river and bar -	59
Llewellyn point -	572	—— directions -	59
Lloyd bay -	278	——, tides -	59
—— islands -	278	Macarthur islets -	291
Locol islet -	491	Macgillivray range -	496
Logan rocks -	348	Macfarlane harbour -	497
Long hill -	165	Mackay -	176
—— island -	154, 180, 380, 437	—— river -	280
—— point reef -	25	Macpherson range -	68
—— reef, Torres strait -	348	Maclatchie point -	480
——, Louisiade -	536	Macquarie fort, Geographical position -	8
—— shoal -	111, 167	—— lake -	29, 31
Look-out cape -	525	—— port, and town -	57
—— point -	69, 248	——, anchorage -	57
Longuerue cape -	584	——, bar -	57
—— islands -	584	——, directions -	58
——, Saddle island -	584	——, pilots -	58
——, soundings -	585	——, tides -	58
Lord Howe island, Admiralty islets -	406-408	Madge reef -	338
——, anchorage -	407	Magazine island -	212
——, Gower mount -	406	Magdelaine cays -	445, 446
——, islet -	407	Maër island -	363
——, Intermediate hill -	407	Magnetic island -	213
——, Sugarloaf -	407	Mai isle -	297
——, supplies, water -	407	Main range, the -	215
——, tides -	408	Maitland -	31
——, winds and weather -	408	Malay reef -	449
——, Wolfe rock -	407	Manao river -	486
Lorne reef -	217	Manifold, cape -	142
Lory point -	545	Manning river, and Harrington inlet -	54
Louisiade archipelago -	532-560	——, tides -	54
——, directions -	554, 555	Man-of-war road and Farm cove -	8
——, soundings -	549	Margaret bay -	289
——, winds, weather -	554	——, island -	518
—— gulf -	466	Marina rock -	341
Low bluff -	97	Marion or Paget reef -	443
Low island -	168, 184	Markham island -	578
—— isles -	240	Marlow hill -	215
——, light -	241	Maroochy river -	97
——, point -	580	Marsden isle -	373, 383
—— Wooded isle -	248	Marshall lagoon -	497
Lower rock -	164	Mary river -	102, 104
Lucy Ravel point -	155	Maryborough -	103, 106
Lump, First Keppel isles -	141	Masthead islet -	138
——, Second, Keppel bay -	131	Mayri bay -	502
—— isle -	186	Meddler isle -	324
—— reef -	249, 272, 284		

	Page		Page
Megara rock - - -	253	Molle port, directions - -	181
Mekinley island - - -	516	-----, tides - - -	200
Melanie rock - - -	256	Monkhouse point - - -	242
-----, shoal - - -	375	Moneta shoal - - -	335
Mellish reef - - -	442	Montemont islets - - -	537
----- anchorage - - -	442	Mooa division, Banks island -	353
-----, beacon - - -	442	Moon islet - - -	31
-----, cay - - -	443	Moresby island - - -	520-526
-----, directions - - -	443	----- anchorages 521, 525, 526	
-----, soundings - - -	442	-----, Can-buoy point -	525
-----, tides - - -	443	-----, Double peak -	521
Melville, cape - - -	255, 399	-----, Emerald point -	522
-----, channel rock -	255	-----, Fairfax mount -	520
-----, openings off -	308, 416	-----, Flinn bay -	525
Mermaid reef - - -	56	-----, Green point -	521
-----, clearing marks -	56	-----, Hoop-iron bay -	521
Messum rock - - -	353	-----, James bay -	522
-----, islet - - -	558	-----, Look-out cape -	525
Mew rivulet - - -	300	-----, Mudge bay -	526
Mewstone island, and anchorage -	540	-----, Natives 520, 521, 525, 527	
Mibu island - - -	472	-----, North point -	526
Mid reefs - - -	358	-----, Observation point -	521
----- rock - - -	297	-----, Pigeon islet -	520
Middle bank - - -	27, 105, 123, 356	-----, Pitt bay -	524, 525
----- banks - - -	80, 319	-----, ----- islet -	525
----- bay - - -	544	-----, Rocky point -	521
----- channel - - -	77	-----, South point -	522
----- harbour - - -	4	-----, tides - - -	524
----- head - - -	4	-----, water -	525, 526
----- isle - - -	201, 446, 514	-----, White point -	527
----- passage - - -	320	-----, port - - -	489-491
-----, directions - - -	320	-----, Conflict reef -	491
----- reef - - -	281	-----, Directions -	491
----- rocks - - -	117, 164	-----, Ethel island -	491
----- shoal, Broad sound -	157	-----, Elizabeth island -	489
Middleton island (doubtful) -	411	-----, Fairfax harbour -	490
----- reef - - -	411	-----, Jane island -	490
Midge islands - - -	474	-----, Mourilyan island -	489
Mid-way rocks - - -	357	-----, Paga point -	489
Milne bay, natives - - -	528-530	-----, Palli Palli point -	489
-----, Aleford islets -	529	-----, tides - - -	491
-----, Discovery bay -	529	-----, rock - - -	376
-----, East cape -	530	-----, strait - - -	573
-----, Killerton islets -	529	Moreton bay - - -	74
-----, ----- mount -	530	-----, Branible bay -	84
-----, Stirling range -	528	-----, Bribie island -	82
-----, water - - -	528	-----, Brisbane -	87
Millport harbour - - -	502	----- bar -	87
Minnie rock - - -	360	----- river -	86
Molle isles - - -	182	----- lights -	85
----- port, anchorage -	181	----- road -	84

	Page		Page
Moreton bay, Caloundra head	74, 82	Mossman river	238
—, Central banks	79	Mound islet, Dunk island	231
—, Cleveland	89	Mount Adolphus islands	303
—, light	90	—, Ernest island	349
—, Comboyuro point	75	—, anchorage	350
—, light	75	—, Mary peak	215
—, Cowan-Cowan point	75	Mourilyan cape	572
—, light	75	—, harbour	233
—, Deception bay	83	—, Armit creek	234
—, directions	91-95	—, Camp point	234
—, Brisbane river	95	—, Goodman rock	233
—, East banks	76	—, Moresby river	234
—, Flinders reef	74	—, tides	234
—, Freeman channel	78	—, Walter creek	234
—, Hutchison shoal	74	—, island	489
—, Howe channel	77	—, reef	380
—, Middle banks	80	Mowatta village	468
—, channel	77	Mud island	87
—, natives	90	Mudge bay	526
—, North Banks	76	—, anchorage	526
—, channel	76	—, island	555
—, point	73	Mudjimba island	97
—, pilots	73	Mulgrave island	354, 355
—, Pumice stone strait	82	—, Cocoa-nut point	355
—, Quarantine ground	89	—, Flat islet	355
—, repairs	87	—, Mulgrave hill	355
—, Ship channel	76	—, natives	356
—, patch	75	—, N. W. point	355
—, signals	72, 85, 86	—, Red point	355
—, Smith rock	73	—, Round rock point	355
—, South-west spit	79	—, Rugged point	355
—, supplies	79, 83, 87	—, Turret hill	355
—, Tangalooma point	75	—, Two Stoned hill	355
—, road	79, 80	—, and Russel rivers	235
—, tides	83, 87, 90	Mullens harbour	503, 505
—, Venus bank	77	Murdoch point	251
—, water	79, 83, 87	Murray islands	363, 364, 423
—, West or Francis channel	85	—, anchorage	364
—, Western banks	81	—, directions	365
—, Yellow patch light	73	—, Dowar and Wyer	
—, Yule road	78	—, islets	364
—, cape and lighthouse	71	—, Maer island	363
—, light	72	—, natives	364
—, telegraph	71	—, tides	364
—, island	71	Mutton Bird islet	407
—, mount Tempest	71	Myall river	40
Morlug islet	304		
Morna point	32, 40	m. islet	251
Morpeth	31	— reef	273, 284
—, isle	166	Nambuckra river	60
Mosquitoes island, anchorage	577		

	Page		Page
Nares rock - - -	206	Newcastle harbour, Outer ledges -	34
Natives, Bampton island -	377	_____, Oyster bank -	34
_____, Darnley island -	369	_____, signals, pilot -	33
_____, Direction, cape -	273	_____, tidal -	32
_____, Home isles -	286	_____, storm -	33
_____, Louisiade archipelago	532, 538, 544, 548, 552	_____, Stockton -	38
_____, Milne bay -	528-530	_____, tides -	36
_____, Moresby island -	520-527	_____, time ball -	39
_____, Moreton island -	90	_____, Tomago, water -	39
_____, Mulgrave island -	356	_____, tugs -	33
_____, Murray isles -	364	Night bank -	559
_____, New Guinea	471, 478, 482, 487, 488, 494, 504, 505, 507, 568, 575, 581	_____, island -	276
_____, Palm isles -	216	Nimrod passage -	313, 418
_____, Platybus bay -	108	Nina peak -	225
_____, Shoal water bay -	154	Nindery hills -	97
_____, Weary bay -	242	Ninepin rock -	376, 384
_____, Weymouth bay -	280	Ninian bay -	255
_____, Wide bay -	100	No. VI. reef -	273
_____, Yule island -	483	_____, VII. islet -	274
Needham point -	574	_____, VIII. islet -	275
Negro head -	518	_____, IX. islet -	276
Nelson bay -	41	_____, X. islet -	277
_____, cape -	579	_____, 1 Sand-bank opening -	261
_____, head, light -	41	_____, 5 Sand-bank opening -	309
Nepean islet -	371	_____, 8 Sand-bank -	309
Nepenthes point, Sud-est island -	546	Nobby head, Newcastle harbour	32
Nereid rock -	333	_____, light -	32
Nereus shoal -	441	Noble island -	253
New Guinea, directions -	554, 555	Norah head -	30
_____, South-east coast	465-531	Norman rock -	275
_____, winds, weather -	554	Normanby island -	564, 565, 568-571
Newcastle -	38	_____, anchorages	565, 571
_____, bay -	295	_____, Centipede bay	564, 565
_____, harbour -	32-39	_____, Chesterfield cape	569
_____, anchorage -	35	_____, Dawson cape	570
_____, Boulder point -	34	_____, Deedes cape	570
_____, breakwater -	33	_____, Duchess cove	569
_____, buoys -	35	_____, _____ islet	569
_____, caution -	40	_____, Massie bay	570
_____, Cawarra shoal -	34	_____, natives -	565
_____, coaling -	38	_____, Observation islet	570
_____, directions	36-38	_____, Perry bay	570
_____, Entrance rock -	34	_____, _____ islet	570
_____, gales -	38	_____, Prevost cape	565
_____, life boats -	35	_____, _____ range	565
_____, lights -	32	_____, sunken coral patches	570
_____, North channel -	35	_____, Twin islets	569
_____, _____, harbour	35	_____, Ventenant cape	564
_____, Old signal hill -	33	_____, _____ islands	564
		_____, water -	571
		_____, rock -	171

	Page		Page
Normanby sound - - -	337	Northumberland isles, Prudhoe isle -	170
Black rock -	337	Rocket spit -	169
directions -	337	South Sall rock -	168
Ghibber, the -	337	Steep isle -	166
Kunai island -	337	Table rock -	166
tides -	337	tides -	169, 170
North bank - - -	71, 357	Tynemouth isle -	167
banks - - -	75	North-west islet - - -	139
Bay point - - -	255	reef, Torres strait -	343
Brother hill - - -	56	reefs - - -	443
channel - 35, 76, 128, 288		Norton point - - -	119
directions - - -	288		
Foreland - - -	528	o. reef - - -	273, 284
Hazard islet - - -	559	Obelisk islet - - -	355
heads, port Jackson -	3	Obree, mount - - -	501
island - - -	358	Observation islet, Normanby island -	570
point - - -	73, 526	place, port Jackson -	8
islands and cays -	156, 157	reef, Coral haven -	548
reef - - -	138	rock, port Bowen -	146
light - - -	138	Ball Pyramid -	408
Torres reef - - -	344	spot, Saxtant rock -	301
North-east, Great, channel -	367-386	Obstruction islands -	562
Northumberland isles -	165-170	caution -	563
Alnwick isle -	166	shoals - - -	156
Bamborough isle -	167	Olden island - - -	183
Beverley group -	169	Olinda entrance - - -	321, 422
Boomerang shoal -	168	One-and-half-mile opening -	261, 415
Cheviot isle -	166	One Tree islet - - -	136
Constance isle -	169	hill - - -	482
Curlew isle -	168	O'Neill island - - -	521
Danger isle -	167	Orange rock - - -	503
Double isle -	169	Orangerie bay - - -	503
Granite isle -	169	Orford bay - - -	292
Hexham isle -	166	Orfordness - - -	292
High Peak isle -	166	False - - -	290
Hunter isle -	167	Orman reef - - -	360
h. h. cluster -	168	Orpheus island - - -	221
h. peak -	168	Osnaburg point - - -	300
h. l. islet -	168	Osprey reef - - -	449
Lola Montes pass -	168	tides - - -	449
Long shoal -	167	rocks - - -	168
Low isle -	168	Oswald reef - - -	256
Marble isle -	167	Otterbourne island -	166
Morpeth isle -	166	Ouessant isle - - -	535
Osprey rocks -	168	Outer banks, Great Sandy strait -	105
Otterbourne isle -	166	ledges - - -	34
Payne shoal -	166	rock - - -	117, 142
Pearl shoal -	169	route - - -	405-464
		Alert reef -	443
		Anchor cay -	423

	Page		Page
Outer route, Avon islets -	439	Outer route, Olinda entrance	321, 432
——, Ball's pyramid -	408	——, Osprey reef -	449
——, Bampton reef -	439-441	——, Pandora entrance	320, 421
——, Bellona reefs -	433-435	——, passage -	451
——, Black rocks entrance	312, 418	——, Portlock and Boot reefs	451
——, Bligh entrance -	424	——, Quoin entrance	311, 417
——, Booby reef -	435	——, Raine island	316, 420
——, Capel bank -	411	——, entrance	316, 453
——, Cato bank -	426	——, tides -	421
——, Caution -	458	——, Remarks, preliminary	391,
——, Chesterfield reefs -	436		392, 405
——, Dangerous ground -	435	——, Sandy islets -	442
——, David reef -	414	——, Saumarez reefs	431, 432
——, Detached, Great, reef	315, 420	——, Single Rock entrance -	419
——, Diana bank -	448	——, Stead passage -	419
——, Directions, Sydney to		——, Swain reefs -	193, 194
Raine island -	452-454	——, Vine Horse-shoe shoal	414
——, Raine island		——, Wreck bay -	418
and Blackwood channel -	454-456	reef -	427, 428
——, making the		——, Yule detached reef -	419
channels through the barrier -	453	entrance -	422, 423
——, Wreck bay		Outlying dangers in Coral sea	425
312, 313, 418		Owen Stanley, mount -	492
——, Openings be-		range	483, 501, 505, 513,
tween lat. 12° 30' S. and Raine			528
island -	456	Oyster bank -	34
——, Pandora en-		——, cay -	258
trance -	456	——, rock and light -	121
——, Papuan or			
Great North-east channel	457, 458	p. reef -	273, 284
——, Torres strait		Packe isle -	328
to Sydney -	459, 460	Paga point -	489
——, Doubtful dangers -	411	Painted rock -	54
——, Dragon bank -	449	Paira point -	494
——, East cay -	423	Pallarenda cape -	211, 215
——, Eastern fields -	450	Palli-palli point -	489
——, reefs, the -	432	Palm isles -	216, 221
——, Elizabeth reef -	408-410	——, Acheron island -	217
——, Fairway reef -	441	——, Bramble rocks -	217
——, Flinders entrance -	423	——, Brisk island -	219
——, passage -	415	——, Chilcott rocks -	218
——, Frederick reef	430, 431	——, Cordelia rock -	216
——, Great North-east channel		——, Curaçoa island -	221
457, 458		——, Dido rock -	220
——, Henry Miller reef -	436	——, Doubtful shoals -	222
——, Kelso bank -	411	——, Eclipse island -	219
——, Kenn reef -	428-430	——, Esk island -	219
——, Lihou reef -	443-445	——, Great Palm island -	217
——, Lord Howe island	406-408	——, Havannah island -	220
——, Middleton reef -	411	——, Herald island -	216
——, Nimrod passage -	418		

	Page		Page
Palm isles, Lorne reef -	217	Papuan, or Great North-east channel,	
——, N. Palm or Pelorus island	221	Marsden isle -	373
——, Orpheus island -	221	——, Melanie shoal -	375
——, Pandora reef -	220	——, Moresby rock -	376
——, Phillips rock -	217	——, Natives -	377, 382
——, Rattlesnake island -	217	——, Nepean islet -	371
——, White rocks -	218	——, Ninepin rock -	376
Palmerston, cape -	165	——, Pearce cay -	372
Pancake creek -	117	——, Rennel isle -	373
Pandora entrance -	320, 421	——, Saddle isle -	376
——, directions -	321	——, soundings -	382, 383
—— passage -	367, 451	——, Stephens isle -	372
—— reef -	220	——, Three Sisters, Bet isle	374, 375
Paples island -	516	——, Poll islet -	375
Papua gulf -	471	——, Sue islet -	375
——, directions and caution -	478	——, Tidal bank -	379
——, flats off the coast -	477	——, tides -	368, 370, 380, 385, 386
——, soundings -	471	——, Tobin cay -	371
——, tides -	478	——, Turtle-backed island -	380
Papuan, or Great North-east channel		——, Warrior island -	378
——, 367-386		——, anchorage	379
——, Ackers shoal -	375	——, reefs -	377
——, Arden islet -	373	——, Wreck shoal -	375
——, Aureed isle -	374	——, York isles -	373
——, Bampton island -	376	Paramatta estuary -	5
——, Basilisk pass -	379	Pariwara islets -	487
——, Black rocks -	368	Parsee point -	586
——, Bligh entrance -	368	Pascoe river -	280
——, Bourke islets -	373	Passage islet -	183, 201, 359
——, Bramble cay -	368, 381	——, reef -	546
——, Bristow island -	377	Peak hill -	125
——, Campbell isle -	372	——, islet -	143
——, Canoe cay -	371	——, point -	323
——, Channel between Murray		Peake rock -	297
and Darnley islands -	370	Peaked hill -	323
——, Cocoa-nut isle -	374	Pearce cay -	372
——, Dalrymple isle -	372	Pearl bay and anchorage -	147, 148
——, Darnley island -	369	Pearn reef -	292
——, natives -	369	Peenacar rock -	350
——, directions -	383, 386	Pelican islet -	131, 271
——, Dove islet -	374	Pelorus or North Palm island	221
——, Dungeness island and reef	379	Pender islet -	558
——, Dutfield rock -	376	Peninsular point -	515
——, entrance, North -	377	Pentecost islet -	189
——, Halfway island -	373, 374	Percy island -	499
——, Hannah bank -	373	—— isles -	170-172
——, Harvey rocks -	375	——, anchorage -	172
——, Jacobus, East, shoal -	373	——, N. E. islets -	172
——, West, shoal -	379	——, No. 1 isle -	170
——, Keats islet -	373	——, No. 2 isle -	171
——, Long island and reef -	380	——, Nos. 3 and 4 isle -	172

	Page		Page
Percy isles, Normanby rock	- 171	Porpoise shoal	- 111
———, Pine islet	- 171	Port Albany	- 297
———, Pine peak, or No. 3. isle	172	—— Bowen	- 143-147
———, Sphinx islets	- 172	—— Curtis	- 119-127
———, S. E. islets	- 171	—— Denison	- 202
———, Tides	- 172	—— Dudfield	- 506
———, water	- 170	—— Hunter (Newcastle harbour)	- 32
Perry bay	- 570	—— Jackson	- 1-25
Peter Botte mountain	- 241	—— Macquarie	- 57
Phipps isle	- 348	—— Molle	- 181
Pier head, Quail island	- 149, 154	—— Moresby	- 489
—— point	- 480	—— regulations, Sydney	- 11-16
Fig island, Coral haven	- 548	—— Stephens	- 40-47
Pigeon islet	- 280, 520	Portlock islet	- 353
Pilot, port Jackson regulations	- 11	——— and Boot reefs	- 366, 367, 451
———, steam vessels	- 11	Positions, table of	- 590-595
———, rock	- 242	Possession, cape	- 482
———, signals, Bar harbours	- 26	——— tides	- 482
Pinacle rock	- 278	——— bay	- 514
Pine head	- 180	——— island	- 324
—— islets, Percy isles	- 171	———, North, islet	- 354
—— mount	- 153	Post office, Booby island	- 340
—— peak, or No. 3 isle	- 172	Postal regulations, Sydney	- 14
—— Trees point, anchorage	- 147	Powell islet	- 558
Pinnacle reef	- 350	—— point	- 337
Pioneer river	- 174	Poynder island	- 163
———, directions	- 175, 176	P'revost cape	- 565
——— Flat top islet	- 175	—— range	- 565
———, light	- 174	Prince river	- 474
———, Mackay	- 176	—— of Wales channel	- 341, 342, 361
———, pilot	- 174	———, directions	- 342, 402
———, signals	- 175	———, —	—
———, Round top islet	- 176	——— from the westward	- 343
———, tides	- 174	——— island	- 328, 331
———, islet	- 573	———, Heath point	- 381
———, point	- 182, 572	Princess Charlotte bay	- 269
——— rock	- 182	Providence bay	- 42
Piper isles	- 282	—— shoal	- 354
———, light-vessel	- 283	Providential channel	- 311
Pipon islet	- 255	Prudhoe isle	- 170
Piron island	- 547	Pudding-pan hill	- 292
Pitt bay	- 524, 525	Pumice-stone strait	- 82
—— islet	- 525	Pym point	- 330
—— rock	- 297	Pyramid point	- 491
—— water	- 27	Pymont, port Jackson	- 11
Platybus bay	- 108	q. islets	- 251
Plomer point	- 58	—— reef	- 273, 287
Pole islet	- 350	Quail island	- 154
Poll islet	- 375	Quarantine ground, port Jackson	- 3
Pollard channel and directions	- 288	———, Moreton bay	- 89
Porlock bay	- 580		

	Page		Page
Queensland, general signals	- 79	Remarks on Raine island entrance	- 317
Quoin entrance	- 311, 417	the Western channels	- 361
island	- 121, 292	through Torres strait	- 367
islet	- 143, 504	the barrier, concluding	- 391
rock	- 348	the Inner and Outer	- 458
, Calvados chain	- 541	routes	- 458
		, on coral navigation	- 458
r. reef	- 253, 275	Renard island	- 441, 466, 543
rr. reef	- 253	Rennel isle	- 373, 383
Raine island and beacon	- 316, 430	Repulse bay	- 179
, directions	- 454-456	islands	- 179
, entrance	- 316, 452	, tides	- 180
, remarks	- 317	Restoration isle	- 279
, supplies	- 317, 421	Reynolds river	- 498
, tides	- 317, 421	Richards cape	- 226
Ramsey bay	- 296	Richardson range	- 290
Raper shoal	- 97	Richmond river	- 64
Rat and Mouse islets	- 519	Richmond river, Ballina	- 65
Rattlesnake island	- 217	, bar, tides	- 65
, mount	- 545	, directions, pilot	- 65
point	- 328, 331	, lights	- 65
Rattray island	- 184	Ridge islet	- 164
Ravenswood gold fields	- 212	Ripple islets	- 149
Rawdon bay	- 577	Riak point	- 476
Rawlins point	- 586	Robinson harbour	- 500
Rawlinson cape	- 574	islands	- 542
range	- 586	Rock Cod shoal	- 139
Raymond isle	- 538	Rocket spit	- 169
Razor islets and point	- 517	Rockhampton	- 132
Real island, Louisiade	- 539	Rockingham bay	- 227
Red banks	- 327	, channel	- 222
cliff	- 271, 290	, directions	- 223
island	- 326	, tides	- 223
peak	- 240	, western shore	- 229
point	- 252, 355	Rocks, doubtful	- 411, 412
Rocky point	- 582	Rocky isles	- 266
Wallis isle	- 327	islet	- 188, 242, 280, 522
Redscar bay, Mission station	- 485	islets	- 128, 174
, anchorage	- 486	pass	- 516
, Lalokie and Goldie rivers	- 485	Rodd bay	- 118
, Towton opening	- 485	harbour	- 118
, Skittle rocks	- 485	, directions	- 118, 119
head	- 485	peninsula	- 118
, caution	- 488	Rodney cape	- 498
hill	- 487	entrance	- 499
Reefs and islets, doubtful	- 411	islet	- 289
outside the Barrier	- 366	Rooney point	- 108
Remarks on cape York	- 305, 306	Ropo-ropo islet	- 504
the Outer route and		Ross creek	- 211
Great North-east Channel	- 405	, anchorages	- 213
		, Castle hill	- 212

	Page		Page
Rose creek, light - - -	213	Salamander bay - - -	44
——, tidal signals - - -	212	—— reef - - -	211
——, Townsville - - -	212	Sand-bank opening, No. 1 - - -	261
Rossel island - - -	551	——, No. 5. - - -	309
——, Deliverance cape - - -	552	Sandfly bay - - -	556
——, mount - - -	551	Sandgate - - -	84
——, West point - - -	551	Sandbanks bay, Domaru river - - -	499
—— reef - - -	553	Sandon bluffs - - -	62
Rothsay banks - - -	329	—— river - - -	62
Roua hills - - -	493	—— shoal - - -	62
Round back mount - - -	206	Sandwich, cape - - -	226
—— head - - -	180, 492	Sandy cape and light - - -	109
—— entrance - - -	493	—— shoal - - -	110
——, anchorage - - -	494	—— tides - - -	111
—— hill - - -	45, 216, 271	Great, strait - - -	100-107
—— Hill head - - -	116	——, directions - - -	101-107
—— creek - - -	116	——, Lights - - -	105
—— islet - - -	143, 357	——, Maryborough - - -	103
——, Louisiade - - -	547	——, Mary river - - -	102
—— point - - -	289	——, Middle bank - - -	105
—— rock point - - -	355	——, North entrance - - -	103
—— top islet - - -	176	——, Pilots - - -	106
Rounded hills - - -	500	——, South entrance - - -	101
Rous channel and bar - - -	70	——, supplies - - -	103
——, buoys - - -	71	——, Tyroom road - - -	104
——, caution - - -	71	——, water - - -	101
——, current - - -	70	——, Woody island - - -	104
Route, Inner - - -	196-200, 263, 265	—— island, Great (Fraser) - - -	108
——, Outer - - -	405-460	—— islets - - -	442
Routes between Australia and China - - -	461-464	—— point - - -	69
——, Eastern - - -	461	——, signal station - - -	70
——, Middle - - -	461	—— shoals - - -	163
——, Torres strait - - -	462	Satellite rock - - -	241
——, Western - - -	462	Saumarez, reefs - - -	431, 432
Roux isles - - -	506	——, S.W. cay - - -	432
Rugged head - - -	507	——, N.E. cay - - -	432
—— islet - - -	539	——, tides - - -	432
—— point, Mulgrave island - - -	355	Schnapper rock - - -	54
Ryley cape - - -	574	Scott rock - - -	243, 333
		Scramble point - - -	516
		Seal rocks - - -	52, 122
		—— rock (Sugarloaf) point - - -	51
s. reef - - -	262, 275	Second 3 mile opening - - -	310, 416
Sable Chief rocks - - -	128	Seven mile creek - - -	119
—— islets - - -	535	Sewell island - - -	499
Saddle isle - - -	376, 384, 385, 584	Sextant rock - - -	301
—— back mountain - - -	176	Shag rock - - -	69, 164
—— island - - -	184	Shallow bight - - -	586
Safe entrance - - -	312, 418	Shark island - - -	7
Saibai island - - -	469	Sharpe isle, Calvados chain - - -	541
Sail rock - - -	168, 541	Shaw island - - -	187

	Page		Page
Shelburne bay	- 290	Sir James Smith group	- 186
Shepherd bay	- 227	Sirius cove, Great	- 9
Sherrard islets	- 277	Sisters, Three	374, 383
Ship islet	- 578	——, Bet, Poll, Sue	- 375
—— rock	- 129	Skelton island	- 556
Shoal point	- 177	——, Sandfly bay	- 556
—— water bay	149-154	Skirmish banks, Moreton bay	- 82
——, Akens island	- 151	Skittle rocks	- 485
——, anchorages	150, 153	Skull islands	- 151
——, Arthur point	- 151	Slade island	- 556
——, Aspect	- 153	—— point	- 177
——, Blind rock	- 152	Slasher reef	- 257
——, Broome head	- 151	Sloss islets	- 540
——, Bryant rock	- 152	Smith, Sir James, group	- 186
——, Cannibal group	- 149	—— islet	- 523
——, Cape islet	- 149	—— lake	- 53
——, Connor rock	- 152	—— pass	- 550
——, Donovan shoal	- 150	—— rock	- 73
——, East banks	- 150	Smoky cape	- 59
——, creek	- 150	Snake islet	- 578
——, Ridge banks	151	Snapper island	- 240
——, Head creek	- 150	Soldier point	- 45
——, Macdonald point	- 151	Solitary islands	- 61
——, Masters rocks	- 151	——, light	- 62
——, natives	- 154	——, soundings	- 62
——, Passage patch	- 153	——, tides	- 62
——, Ripple islets	- 149	—— islet	- 585
——, Sabina point	- 151	Somerset	- 298
——, Separation bank	- 152	Sound, the, port Jackson	- 3
——, Skull islands	- 151	South bank	- 356
——, tides	153, 154	—— cape	- 507
——, Triangular islands	150	—— channel, port Curtis	- 123
——, Turn shoal	- 150	—— heads, port Jackson	- 2
——, West bight	- 152	—— islet	357, 446
——, Ridge banks	152	—— point, Banks island	- 353
——, White rocks	- 150	—— Torres reef	- 343
——, shoal	- 150	——, Sail rock	- 168
Shortland islet and reefs	- 527	Spear islets	- 580
Sidmouth, cape	- 274, 400	Sow and Pigs shoals	- 5
Signals, New South Wales, storm	- 18	Spencer isle and rock	- 347
——, pilot	- 26	Sphinx islets	- 179
——, Queensland, general	- 72	Spike island and anchorage	- 598
Simpson bay	- 324	Spurs rocks	- 171
—— channel	- 344	St. Aignan island	- 543
——, directions	- 345	St. Lawrence creek	- 159
——, mount,	- 505	Stacey island, Mission station	- 507
Singapore rock	- 186	——, South cape	- 507
Single rock entrance	- 313, 419	Stanage bay	- 154
Sir Charles Hardy isles, anchorage	- 286	Stanley mount	- 125
——, tides	- 286	Stanton isle and shoals	- 541
——, water	- 286	Stanwell island	- 562

INDEX.

625

	Page		Page
Stead passage - - -	313, 419	Sud-est, island - - -	545, 546
Steep point, Hayter island - - -	515	Bousquet point - - -	546
isle - - -	166	Brady point - - -	545
islets - - -	584	Condé point - - -	546
Stephens isle - - -	372, 382	Lory point - - -	545
point and light - - -	41	Nepenthes point - - -	546
, port - - -	40-47	Passage reef - - -	546
, anchorages - - -	43	Rattlesnake mount - - -	545
, Boandabah island - - -	44	, water - - -	546
, Boondelbah island - - -	43	Sue islet - - -	375
, Corlette head - - -	43	Sugarloaf bay - - -	52
, directions - - -	44, 47	point - - -	51
, Entrance shoal - - -	42	light - - -	52
, Fly road - - -	42	Sugarloaves, the - - -	30
, Lights - - -	41	Sunday islet - - -	289
, Manton bank - - -	43	Sunk or a reef - - -	342
, Middle ground - - -	42	Sunken Barrier reef - - -	510, 534
, Narrows, the - - -	43	Suns glare - - -	458
, Nelson bay - - -	43	Sutherland point - - -	67
head - - -	41	Supply bay anchorage - - -	149
, Red Patch point - - -	43	Swain reefs - - -	193, 194
, Round hill - - -	45	Swain reefs, tides - - -	195
, Salamander bay - - -	44	Sydney (see Jackson port) - - -	1
, Soldier point - - -	45, 46	cove - - -	9, 10
, South channel - - -	43	electric telegraph - - -	2
, Station peak - - -	41	heads - - -	2, 3
, Telegraph - - -	41	population - - -	11
, Tides - - -	44	to port Stephen - - -	1-47
, Toomeree (South head) - - -	41	gales - - -	36, 38
, Wanda Wanda head - - -	44	Sykes rock - - -	376
, West bank - - -	43		
, winds - - -	47		
, Yacaaba (North head) - - -	41		
Stirling range - - -	528, 576	t. reef - - -	262, 275, 290
Stockton - - -	38	t t. reef - - -	276
Stone island - - -	202	Table bay - - -	501
Stonehenge - - -	347	gorge - - -	30
Stradbroke island - - -	68	hill - - -	223
Stragglings islets - - -	584	point - - -	500
Strait rock - - -	332	topped hills - - -	500
isle, East - - -	341	Tacking point - - -	56
Stralock mount - - -	225	Tablee house, port Stephens - - -	45
Strong Tide passage - - -	148, 151	Talbot group - - -	468
, Torres strait - - -	357	island - - -	465
Stuart mount - - -	209, 215	Tam O'Shanter point - - -	230
Stuvers islets - - -	535	Tangalooma, ship patch - - -	75
Suckling, cape - - -	484	Tauan, or Mount Cornwallis - - -	469
, mount - - -	505	, tides - - -	469
, reef - - -	535	, Mission station - - -	469
Sud-est barrier reef - - -	550	Telegraph shoal - - -	40
, cape - - -	581	Tempest, mount - - -	71

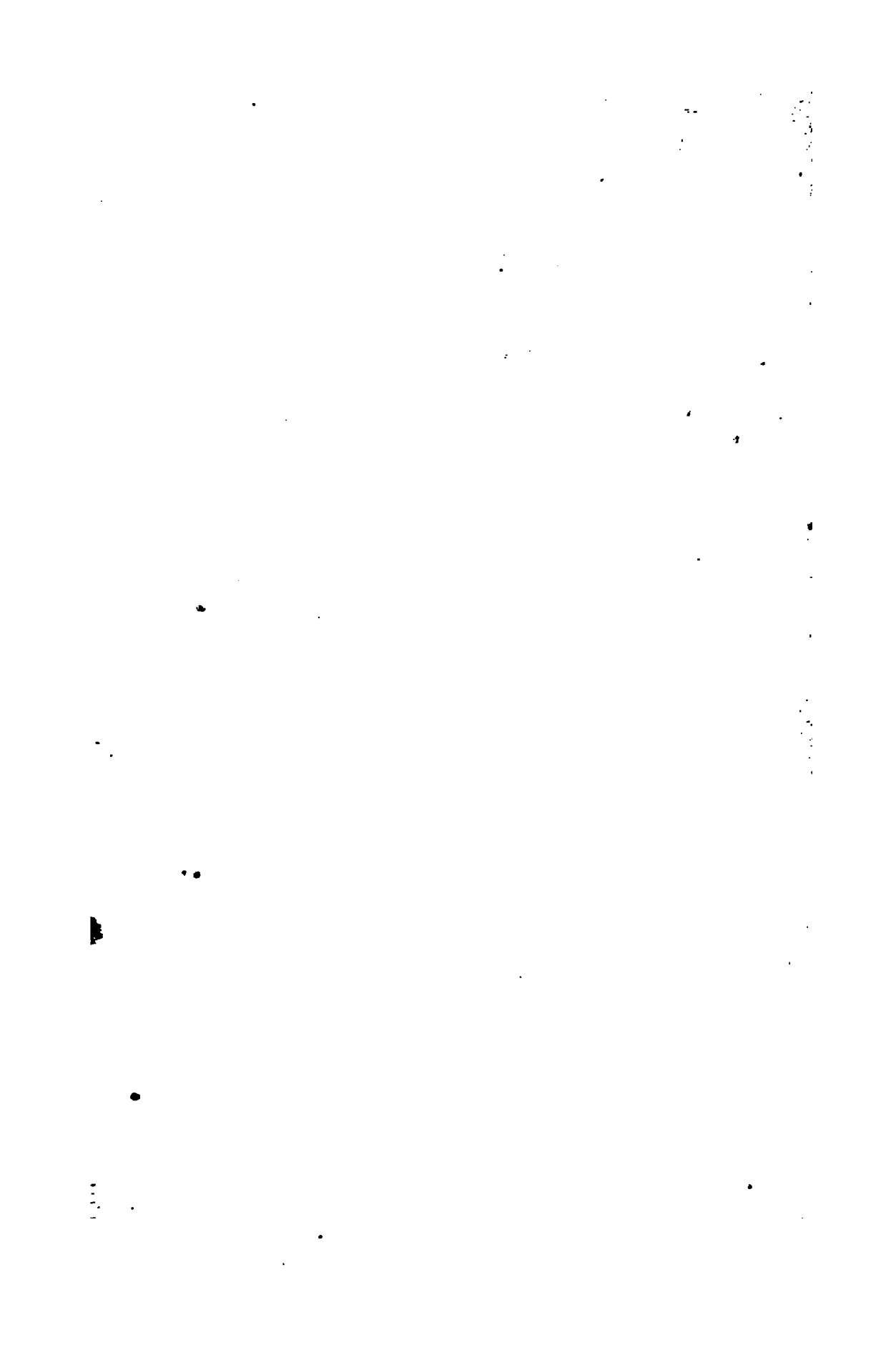
	Page		Page
Temple bay - - -	282	Tides, Capricorn group - -	140
— islands - - -	165	—, Cato bank - - -	427
Tern islet - - -	293	—, Chesterfield reefs - -	438
— cliff - - -	293	—, China strait - - -	567
Terregal harbour - - -	30	—, Claremont group - - -	271
Tessy point, Goode island -	337	—, Clarence river - - -	63
Teste island, anchorage -	532, 533	—, Cleveland bay - - -	213
—, Boat rock - - -	533	—, Cumberland islands - -	192
—, Clifty islet - - -	533	—, Curtis channel - - -	394
—, East islet - - -	533	—, — port - - -	125
—, lagoon - - -	533	—, Danger point - - -	67
—, tides - - -	533	—, Darnley island - - -	370
—, West islet - - -	533	—, Deuison port - - -	204
Thirsty sound - - -	155	—, Douglas port - - -	239
Thomas island - - -	187	—, Dunk island - - -	231
Thomson, mount - - -	505	—, Elizabeth reef - - -	410
Thorpe point - - -	289	—, Endeavour river - - -	245
Three Brothers - - -	55	—, — strait - - -	325, 328
— isles - - -	248	—, Evans bay - - -	302
— Points, cape - - -	25	—, Fitzroy island - - -	237
— rocks - - -	185	—, Flinders isles - - -	268
— Sisters - - -	374, 383	—, Fly river - - -	474
Thumb, the - - -	224	—, Fortescue strait - - -	524
Thursday island - - -	336	—, Frederick reef - - -	431
—, Kapuda islet - - -	336	—, Göschen strait - - -	563, 567
—, Vivien point - - -	336	—, Great Sandy strait - -	103, 106
Tides - - -	589	—, Hayter island - - -	515
—, Albany pass - - -	299	—, Hervey bay - - -	112
—, Adolphus mount - - -	385	—, — islands - - -	147
—, Avon islets - - -	439	—, Hillsborough, cape, to	cape
—, Barrier reefs - - -	424, 425	Conway - - -	199
—, —, lat. 20° 40' S. - -	196	—, Huon gulf - - -	584
—, Barrow point - - -	265	—, Jackson, port - - -	24
—, — to cape Melville -	265	—, Kenn reef - - -	430
—, Bell cay - - -	195	—, Keppel bay - - -	133
—, Bellinger river - - -	60	—, — isles - - -	142
—, Bellona reefs - - -	433, 435	—, Lady Elliot isle - - -	136
—, Blackwood bay - - -	304	—, Lihou reef - - -	445
—, — cape - - -	482	—, Lizard isle - - -	251
—, — channel - - -	320	—, Lord Howe island - - -	408
—, Booby island - - -	340	—, MacLeay river - - -	59
—, — reef - - -	435	—, Macquarie, port - - -	58
—, Bowen, port - - -	147	—, Manning river - - -	54
—, Bramble cay - - -	368	—, Mary river - - -	103
—, Breaksea spit - - -	110	—, Mellish reef - - -	443
—, Broad Sound - - -	161	—, Molle port - - -	200
—, Broken bay - - -	29	—, Moresby port - - -	491
—, Burnett river - - -	115	—, — island - - -	524
—, Byron, cape, bay - - -	66	—, Moreton bay - - -	83, 87, 90
—, Cairns - - -	239	—, Mourilyan harbour - -	234
—, Capricorn channel - -	197	—, Murray isles - - -	364

627

	Page		Page
Tides, Nabuckra river - -	60	Townshend, cape - -	148
—, Newcastle harbour - -	36	—, island - -	148
—, New Guinea, N.E. coast -	588	Townsville - -	212
—, Normanby sound - -	337	Tow-tou, opening - -	485
—, Northumberland isles -	169, 170	Trafalgar, mount - -	579
—, Osprey reef - -	449	Traitors bay, natives -	582
—, Papua gulf - -	478	Travers isle - -	345
—, Papuan or Great North-east		Treachery head - -	52
channel - -	385, 386	Trec island - -	474
—, Percy isle, No. 2 - -	172	— islet - -	297
—, Philip harbour - -	359	—, Farm bay - -	507
—, Possession, cape - -	482	—, Rossel island - -	552
—, Prince of Wales channel -	343	—, Torres strait - -	857
—, Princess Charlotte bay -	271	Tregosse islets and reefs -	445
—, Raine island - -	317, 421	Trial bay - -	59
—, Repulse isles - -	180	Triangle cliff - -	108
—, Richmond river - -	65	Tribulation, cape - -	241
—, Rockingham channel - -	223	Trinity bay - -	237, 240
—, Sandy cape - -	111	—, Daintree river - -	239
—, —, Great, strait - -	108, 106	—, Dickson inlet - -	238
—, Saumarez reefs - -	432	—, Double island - -	239
—, Shoal-water bay - -	154	—, Douglas port - -	239
—, Sidmouth cape, to cape Gren-		—, False cape - -	237, 238
ville - -	285	—, Island point - -	238
—, Sir Charles Hardy isles -	286	—, Macalister range - -	240
—, Stephens, port - -	44	—, Mossman, river - -	238
—, Strong Tide passage - -	148	—, Snapper island - -	240
—, Swain reefs - -	195, 414	—, Tides - -	239-240
—, Tauan island - -	469	—, (Cairns) harbour - -	238
—, Teste island - -	533	—, opening - -	258, 415
—, Thomas island - -	192	Tuesday islets - -	332
—, Trinity bay - -	239, 240	Tuft islet - -	347, 539
—, Tribulation cape - -	251	Tuggarah lake - -	29
—, Turtle-backed isle - -	380	—, reef - -	30
—, Tweed river - -	67	Turn island - -	157
—, Upstart, cape - -	208	— shoal - -	150
—, Ward Hunt strait - -	578	Turret hill - -	355
—, Whitsunday passage - -	199	Turtle-back isle - -	502
—, Wide bay - -	100	Turtle-backed islet - -	380
—, Willis group - -	447	— group - -	251
—, Wreck reef - -	428	—, directions - -	251
Timandra bank - -	129	— head - -	293
Tin can creek - -	99	— isle - -	296
Tissot isle - -	508	—, reef - -	244
Tobin cay - -	371	Tweed river, and pilot -	67
— islet - -	354	Twin peak, Inner - -	68
Toomere head - -	41	Two isles - -	248
Torres reef, North - -	344	— Stoned hill - -	355
—, South - -	343	Tynemouth bank - -	320
Toulon island - -	502	Tyroom road - -	104, 107

	Page		Page
u. reef - - -	262, 276	Ward Hunt strait - - -	578
Ufa rock - - -	295	Warning, mount - - -	66
Ulrica point - - -	296	Warrawolong mountain - - -	29
Upper head - - -	159	Warrior island - - -	378
Upright point - - -	30	——, anchorage - - -	379
Upstart bay - - -	208	——, reefs - - -	377, 385
——, Wickham river - - -	208	Water Park creek - - -	142
——, cape, anchorage - - -	207	Waterview bay - - -	9
——, tides - - -	208	Watson bay - - -	6, 10
——, water - - -	207	——, cay - - -	353
Usborne river - - -	486	Watts cape - - -	574
Useless islets - - -	517	——, island - - -	557
		Waverley creek - - -	159
		Weary bay - - -	241
v. reef - - -	277, 291	——, Bloomfield rivulet - - -	241
Vallack point - - -	295	——, natives - - -	242
Variation - 1, 48, 112, 201, 266, 323, 405, 465, 532		Webb islands - - -	506
Vauluse bay - - -	6	Wedge island, - - -	131
Venus bank - - -	77	—— rock - - -	508
Ventenant cape - - -	564	Wednesday island - - -	332
——, islands - - -	564	Wensley mount - - -	97
——, Grind reef - - -	564	West banks, port Curtis - - -	123
Vernon point - - -	104	—— Entrance islet - - -	479
Victory heights - - -	240	—— hill - - -	156, 163, 165
——, mount - - -	579	——, sandy shoals - - -	163
View hill - - -	121	——, water - - -	163
Vinall cape - - -	578	—— island and shoal - - -	347
Vine bank - - -	443	—— islet - - -	428, 517, 533
——, Horse-shoe shoal and David reef - - -	414	—— Ridge banks - - -	152
Virago rock - - -	214	—— rocks, Torres strait - - -	356
Vivien point - - -	386	Westhall, mount - - -	143, 147
Vogel cape - - -	578, 579	Westminster Abbey - - -	222
		Weymouth bay, and natives - - -	280
		——, cape - - -	279
		Whale isle - - -	348
w. reef - - -	262, 277, 291	Wheatsheaf and Observation rocks - - -	408
Waddy point - - -	109	White point - - -	527
Wai-Weer islet - - -	335	——, rocks - - -	150, 218, 345
Wales, Prince of, channel - - -	341, 383, 402	—— shoal - - -	150
——, directions - - -	342, 343	Whitsunday island - - -	190
——, island - - -	328, 331	——, passage - - -	199
Walker point - - -	242	——, tides - - -	199
Wallabi point - - -	53	Wickham river - - -	208
Wallis, Red, isle - - -	327	Wide bay - - -	98
——, Woody isle - - -	327	——, bar - - -	99
——, lake - - -	53	——, harbour - - -	99
Walter bay - - -	491	——, directions - - -	100
Wansfell reefs - - -	443	——, Hook point - - -	99
War song point - - -	582	——, Inskip point - - -	99
		——, natives - - -	100
		——, pilots, signal station - - -	100

	Page		Page
Wide bay, tides - - -	100	z. reef - - -	294
——, Tin can creek - -	99	—reefs - - -	278
Wilkingen reef - - -	269		
Willis group - - -	446, 447	y. reef - - -	279, 294
——, anchorage - - -	447	Yacaaba head - - -	41
——, Middle islet - - -	446	Yaralla shoal - - -	164
——, North cay - - -	447	Yellow Patch light - -	73
——, Northern passage -	447	Young islet - - -	284
——, soundings - - -	447	York, cape - - -	301
——, South islet - - -	446	York, cape, remarks on -	305, 306
——, passage - - -	446	——, and Eborac isles -	301
——, tides - - -	447	—— isles - - -	373
——, turtle - - -	446	——, road - - -	300
Wilson isles - - -	348	——, directions - - -	302
Winds and weather, Jackson, port -	17	Yule channel - - -	346
——, Louisiade - - -	554	——, directions - - -	346
——, New Guinea - - -	554, 565	—— Detached reef - -	313, 419
—— - - -	588	—— entrance - - -	362, 422
——, Stephens port - -	47	—— island - - -	483
——, Sydney to Torres		——, mission station -	484
strait - - -	387	——, natives - - -	483
Wolfe rock - - -	407	——, mount - - -	483
Wooded bluff - - -	64	—— point - - -	329
Woody island - - -	104	—— road, Moreton bay -	78
——, islands - - -	325		
——, isle, Low - - -	268	x. - - -	279, 294
——, islet, Louisiade -	549	Zebra shoal - - -	222
——, Nos. 1, 2, 3 - - -	294	Zoe bay - - -	226
——, North, peak - - -	53		
——, South peak - - -	53	1, 2, and 3 reefs - - -	282
——, Wallis isle - - -	327	4 and 5 reefs - - -	282
Wooli Wooli river - - -	62	I. and III. reefs - - -	249
Woolomoloo, Sydney - -	6	3 mile opening, First -	309, 416
Wreck bay - - -	312, 418	——, Second - - -	310, 416
——, directions - - -	313, 418	VI., No., reef - - -	273
—— islet - - -	137	VII., No., islet - - -	274
—— reef - - -	427	VIII., No., islet - - -	275
——, anchorage - - -	428	IX., No., islet - - -	276
——, Bird islet - - -	427	X. No., islet - - -	277
——, tides - - -	428		
——, West islet - - -	428		
——, shoal - - -	375		
Wyer isle - - -	364		



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100

101

102

103

104

105

106

107

108

109

110

111

112

113



